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The textbook briefly describes the history of pediatrics. Particular attention is given to the anatomical and physiological characteristics of children of different ages, the problem of modern physical, neuropsychic development of children in connection with acceleration. The issues of nutrition are considered depending on the age of the child. Semiotics of the child's morbid conditions is presented in the form of syndromes, especially manifestations of decompensation of various body systems.The textbook is intended for students of medical universities.

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PREFACE

In 1932 in our country were founded the world's first pediatric departments in medical schools and organized Pediatric Medical Institutes. The first textbook that was used by the students in study process was of propaedeutics of children's diseases "Physiology and Dietetics of a child" [Luntz R.O. 1935]. In 1940 the textbooks on propaedeutics of childhood diseases were published by A.F. Tour, V.I. Molchanov, D.D. Lebedev and Y.F. Dombrovskaya, which were used by the students of pediatric departments. Those books were printed repeatedly many times. However, the achievements in modern medicine, including paediatrics, enriched the knowledge of clinical anatomy, on physiological and biochemical characteristics of healthy and diseased children.

Currently, new instrumental and laboratory research methods are used, there have been significant changes in the approach to diagnostics, were defined pronounced pathomorphoses of clinical course of many diseases and extended the therapeutic and preventive measures.

After the last edition of "Propedeutics of children's diseases" textbook has been more than 10 years. Within this time, much of curriculum for pediatricians have changed, in the program course of propaedeutics of childhood diseases were made major changes, the requirements for qualification of medical school graduates have been complexified. In pediatric faculties were opened specialized departments of neurology, skin diseases, otolaryngology, ophthalmology, hygiene, etc., which thoroughly study the research methodologies and features of individual systems of children's body.

Therefore, there was no more need for presentation of special topics in the course of propaedeutics of children's diseases. In addition, hours amount allotted to the study of curriculum of childhood diseases propaedeutics does not allow to cover all sections of propaedeutic of pediatrics, which is essentially a childhood medicine. All these aspects made it necessary to compose a new textbook in accordance with the new curriculum and program.

The authors are grateful for comments and suggestions, which will undoubtedly arise among readers while studying this textbook.

INTRODUCTION

Pediatrics (from Greek pais, paidos - child, iatreia - doctoring) studies the laws of development of children, causes and mechanisms of diseases, methods of detection, treatment and prevention. Therefore, it can be defined as a medicine of growth period, of formation and development of human body, which is the most liable to human's life. This is so-called progressive stage in human life cycle. That's why it is considered to have unusually high humanism of this specialty and human responsibility for the ones, who have chosen to be paediatrics.

The pediatrician is in constant communication with the child and his parents as well as grandparents. The child's doctor should be a good psychologist and pedagogue. This will allow him to gain prestige from their parents and relatives to gather their efforts and direct to the proper development, and in the case of the disease to rapid recovery of the child. The origins of many adult diseases begin in childhood. So, what are the childhood, growth conditions and upbringing of the child so will be the health state of the adult.

Teaching pediatrics in pediatric departments of medical institutions begins in the III year, when the propaedeutics of children's diseases is studied. This is actually the first department, giving the student professional training. Since the pediatrics studies the growth period and development of the child, it becomes clear that at every stage of the child's life is characterized by specific morphological, physiological and psychological qualities. Therefore, knowledge of clinical anatomy and physiology of children of different age groups is the basis for understanding the identity of research methods and assessment of the results. In addition, taking into account the basic anatomical and physiological characteristics help to determine the specific organization of an environment and vital regulations, as well as the nutritional status of children of different age groups.

At the department of propaedeutics of children's diseases is also studied the semiotics of major various systems and organism traumas as a whole. Since the systematic presentation of nosological forms of childhood diseases is already the main subject of the Pediatrics course, so the study of propaedeutics diagnostic issues are discussed in two more extended aspects. Firstly, it is symptom diagnostics based on knowledge of the age norm and the research method, and following purpose of ascertaining the presence of symptoms of pathology; secondly, it is syndrome diagnostics, i.e. statement of pathophysiological link between the multiple symptoms of a disease and reflection of functional insufficiency (decompensation) of the indicated physiological system.

The objective of the course includes mastering by the students the techniques of childcare and medical procedures, as well as the procedures belonging to the skills of nurses.

In the later senior years the students are to be taught pediatrics not only in the departments of pediatrics, but also on specialized departments (childhood infections, pediatric surgery, pediatric neurology, pediatric otolaryngology, pediatric ophthalmology, etc.).

The effectiveness of self-instruction and subsequent growth is largely determined by how quality the students managed to master the basic medical - biological disciplines at university stage of education. They constitute the foundation for further clinical training and improvement. Opportunities for self-education for pediatricians are great and various. This is primarily a constant work on the scientific literature and primarily reading of pediatric scientific journals, handbooks and monographs. A very important role in improving the knowledge of pediatricians played their part in the local branches of the All-Union Scientific Society of Pediatricians, founded in all countries, regions and mainly big cities. Being a member of this society was a professional honor for every Soviet pediatrician.

Pediatrics is not only an area of medical science, but also the name of the primary medical specialty in the state system of children's healthcare. Pediatricians implement the major advances in medical science and carry out practical measures to ensure and control harmonic development of children, recognition, treatment and prevention of their diseases. Workplaces of pediatricians are childcare facilities (nurseries, nursery-gardens, orchards, schools, orphanages, and summer camps), children's polyclinics, children's hospitals (general and specialized), teams of pediatric emergency room, children's wards of maternity hospitals, various advisory offices and clinics, children's sanatoriums.

Chapter I

GENERAL ISSUES OF PEDIATRICS

1. BRIEF HISTORICAL DATA

The beginning of studying children can be referred to the IV century BC, to the time of the book "On the nature of the child" written by Hippocrates, the father of medicine. Following Hippocrates about children, childcare and upbringing, wrote Celsus, Galen and Soranus (I and II century). In the next 15 centuries, information stated by Galen and Soranus was only repeated. Treatment of children in these years was carried out according to the same principles of adult patients or wasn't practiced at all. Only in the XV-XVIII centuries again interest awakened in the treatment of children and its characteristics. This was due to a very high infant mortality, the emergence of charitable organizations and the creation in some European countries, educational homes or shelters for foundlings and homeless children. Were published a large number of works devoted to the education and nursing children. In 1650 was released a treatise on rickets of an English physician Glisson, afterwards followed the series of works of Sydenham, Haberzhen, Jenner, devoted to the study of infectious diseases in children. Approximately 100 years after the work of Glisson was published the first manual in pediatrics in 28 chapters. It was written in 1764 by a Swedish physician Nile Rosen von Rosenstein. After 30 years his textbook was published in Russian in Russia.

After opening the first pediatric hospitals there is an intensive growth of scientific researches in the field of pediatrics and the formation of pediatricians schools. The first children's hospital in the world was Paris Hospital for Children, which opened in 1802. A little later there was the German School of Pediatrics. Its centers were in Vienna and Berlin. As the main focus of the researches German pediatricians had chosen biochemical and microbiological aspects of children's diseases, as well as nutrition issues. In the second half of the XIX century started functioning the scientific and clinical pediatrics centers in England, Switzerland, Italy, the Nordic countries and the United States.

In Russia, the sequence of events was very close to that seen in Europe. Peter I in 1727 issued a decree "On building hospitals in Moscow for placing illegitimate babies and on giving them money and salaries for their nurses." Lomonosov in his letter, "On the propagation and preservation of the Russian people" pointed out the need for people's hospices for illegitimate babies and publication of manuals on curing childhood diseases. However, foster homes were opened only in 1763 in Moscow and in 1771 in St. Petersburg, due to the perseverance and energy of I.I. Betsky, who himself composed projects of these houses and wrote instructions about caring for children and their upbringing.

Start of becoming pediatrics as an independent scientific discipline was fulfilled within other scientific disciplines, closely related to medical specialties. They are therapy and particularly obstetrics. Among the physicians the first to

lecture the questions of children's diseases at Moscow University were professors S.G. Zybelin and G.I. Sokolsky. Greatest contribution to the development of pediatrics and its formation as an independent discipline was implemented by obstetricians N.M. Maksimovic- Ambodik, S.F. Hotovitsky and N.A. Tolsky. The lectures and the book of Ambodik - Maksimovic "Obstetrician art or science about women" were presented valuable ideas on the peculiarities of children and methods for their nursing.

Professor obstetrician of Medical-Surgical Academy in St. Petersburg (currently the Military Medical Academy) Stepan Fomich Hotovitsky was also the first Russian scientist and pediatrician. In the period of 1831-1847 he lectured an independent course of childhood illnesses, in 1842 opened the children's wards in the clinic of obstetrics, women's and children's diseases, and in 1847 published the first Russian textbook of pediatrics - "Pediyatrika".

The first children's hospital in Russia was opened in St. Petersburg in 1834. At present, it is named after N.F. Filatov. By the time of opening this hospital was the second children's hospital in Europe. After 8 years begins functioning Children's Hospital in Moscow (now also as Filatov Hospital), and after 2 more years, in 1844, in St. Petersburg was opened the world's first hospital specifically for young children (now Hospital of L. Pasteur).

The date of emergence of the first Russian department of pediatrics can be considered as 1865, when a separate course of childhood illnesses was instructed to be lectured by Professor V.M. Florinsky at the Medico-Surgical Academy. From 1870 Nikolai Ivanovich Bystrov (1841 - 1906) worked in this department. N.I. Bystrov in 1885 organized and was the first chairman of the Society of Pediatricians in Petersburg. He trained many students who later became professors and those who founded the Department of Pediatrics in the country.

In Moscow, lecturing a course on pediatrics began in 1861 by associate Professor of the Department of Obstetrics and later Professor Nikolai Tolsky (1830-1891). After 5 years, he opened a small children's hospital (11 beds), beside the faculty therapeutic clinic of the university. Thus, in Moscow simultaneously with St. Petersburg there were departments of Pediatrics.

In those years in St. Petersburg started developing the activities of prominent doctor and public figure Karl A. Rauhfus (1835 - 1915). He designed the hospitals which were built in St. Petersburg (nowadays a hospital is named after him) and in Moscow (now the Rusakov Hospital). They were the first hospitals in the country, designed according to the requirements of hospitalization of children with different profiles pathologies. The first of these hospitals Karl Rauhfus headed to the end of his life. He trained a large number of pediatricians, dedicated to their job. His works dedicated to heart disease in children and the organization of pediatric care were included in the fundamental three-volume manual of Pediatrics, composed by a team of European authors, edited by Gerhardt (1877).

A significant contribution to the development of domestic science was introduced by the successor of the pediatric N.I.Bystrov in the Department of

Pediatrics at Medical-Surgical Academy, a student of N.A.Tolsky Professor Nikolai Gundobin (1860-1908). He and his students in a short time gained a lot of scientific data on the anatomical and physiological characteristics of children, and on this basis N.P. Gundobin issued a fundamental work, which has not lost its value even in present days - "Features of Children's ages." Besides this book he wrote a popular manual "Total and private therapy of childhood diseases", which was published repeatedly through several editions.

S.F. Khutovitsky

N.I. Bystrov

The most vivid mark in the history of pediatric science was left by the activities of a talented physician and teacher, successor of N.A. Tolsky in the Department of Pediatrics at Moscow University Nile Fedorovich Filatov (1847-1902). His erudition, medical logic and observation have earned deep respect and gathered around dozens of talented students. He first described the clinic of rubeola scarlatinosa and glandular fever (infectious mononucleosis), as well as an early sign of measles - defurfuration the mucous membrane of the lips and mouth. He is one of the first to understand the value of atelectasis in the occurrence of pneumonia and described heart disease in scarlet fever in children. The most vivid memory of the activity of this distinguished clinician was left in his books, read and popular so far. It is "Semiotics and the diagnosis of childhood diseases", "Lectures on acute childhood infections ", "Clinical Lectures", "Short textbook of childhood diseases." All of them were translated into many European languages and have brought glory to Russian clinical thought. In the Soviet Union was founded an award for the best works in pediatrics named after N.F. Filatov. In Moscow, was established a monument for Filatov with the inscription "For a friend of Children".

N.A. Tolsky

K.A. Rauhfus

Children's Hospitals and departments of pediatric were created gradually in many cities in Russia and the remote region. In Kazan, the department of Pediatrics was headed by Professor N.A. Tolmachev, in Kiev by Professor V.Y. Chernov, in Kharkov by Professor I.V. Troitsky, in Odessa by Professor V.F. Yakubowicz, in Yuriev (now Tartu) by ProfessorV.P. Zhukovsky, in Saratov - Professor I.N. Bystrenin.

N.P.Gundobin

N.F.Filatov

An important feature of Pediatrics of last pre-revolutionary decade was the growth of interest in the youngest age. In 1908 in Moscow by initiative of G.N.Speransky the first consultation for infants was opened, and in 1910 was

founded the first clinic for infants, in 1913 was established an Office for infants in the Morozov Children's Hospital (now Children clinical Hospital № 1). Since that time, the proportion of young children in all children's clinics and hospitals in Russia significantly increased.

Thus, the pre-revolutionary period of the development of Pediatrics is significantly distinguished by all those names of prominent Russian scientists and doctors, whose talents ensured the accumulation of knowledge about the physiology and diseases of the children, and earned the Russian science international recognition and priority for many sections of Pediatrics. During this period major scientific schools were established and simultaneously was defined the unity of Russian pediatrics, were formed its social and humanistic moral platform, focus on the solution of a wide range of issues of maternal and child health. A peculiar result of the development of pediatrics in the country was held in 1911, by the first All-Russian Congress of pediatricians, which examined care issues of newborns. Together the leading pediatricians and public figures created a variety of communities and charity movement, the purpose of which was to assist children in distress in the country. So, in 1904, were founded the St. Petersburg Union against child mortality, in 1909 the Society against infant mortality in Moscow, in 1913 the All-Russian welfare of mother and child protection.

A.A. Kissel

V.I.Molchanov

After the Great October Socialist Revolution, a great contribution to the development of Soviet Pediatrics was introduced by a number of outstanding scientists. Among them we can mention the names of the professors of the Moscow school. They are Alexander A. Kissel (1859-1931), a disciple of N.I. Bystrov and S.P. Botkin, who did much for the study of rheumatism, chronic non-rheumatic polyarthritis, tuberculosis, malaria.

As a physician and health organizer he widely deployed activities for the children's health centers and the development of methods of sanatorium treatment of children's diseases.

Vasily Molchanov (1868-1959), a disciple of Filatov studied respiratory disease, growth and development disorders in children, clinic of toxic diphtheria, scarlet fever and heart disease during it, and the relationship of scarlet fever with rheumatism. Co-workers and followers of V. Molchanov were Professor D. Lebedev, who also worked on the problems of childhood infections and cardiac lesions in children, and Academician of the USSR Academy of Medical Sciences, Professor Julia Fominichna Dombrovskaya (1891 - 1976). She was the author of fundamental research and guidelines for respiratory diseases, high-quality nutritional and vitamin deficiency diseases in children. V.I. Molchanov, D. Lebedev and Y.F. Dombrovskaya contributed in the composition of the textbook "Propaedeutics of children's diseases", which went through 5 editions until 1970 and has retained its importance up to the present time.

Y.F. Dombrovskaya

School of the leading scientific center of the country of the Central Research Institute of Maternity and Infancy was led by Professor Georgy Nesterovich Speransky - Academician of the Academy of Medical Sciences of the USSR, member - correspondent of the Academy of Sciences of the USSR, Hero of Socialist Labor, one of the pioneers of the study of the physiology and pathology of early childhood period, the first organizer of the consultation and the department of nursing babies.

He devoted his life to the study of mainly nutrition disorders, diseases of bronchopulmonary apparatus and sepsis in children during the first weeks and months of life. Speransky wrote manual on this pathology - "Textbook of disease of

young children", which for many years served as the main guide for doctors offices and neonatal pathology younger. For many years, G.N. Speransky was the editor of the journal "Pediatrics" and headed the All-Union Scientific Society of Pediatricians.

G.N. Speransky

Dozens of his students led the Department of Pediatrics in Moscow and throughout the country. In Moscow, actual scientific problems of Pediatrics developed by S.I. Fedynsky, N.I. Langovoy, A.A. Koltypin N.I. Osinovsky, V.A. Vlasov, I.V. Tsimbler, N.F. Altgauzen, D.D. Lebedev, A.I. Dobrokhotova and others.

In Leningrad, the main center for pediatric research remained the Military Medical Academy, where after N. atrium was headed by Nikolai Shkarin (1876 - 1921). He is known for his work on dietetics, and anomalies of the constitution and that he began working on the study of age-related biochemical features. Professor of the department, headed by N. Shkarin was Mikhail S. Maslov (1885-1961). M.S. Maslov headed the Department of Pediatrics of the Academy since 1921 and since 1925 simultaneously he directed the Department of Pediatrics of the Leningrad Pediatric Medical Institute. He is considered as the head of the Leningrad Soviet school of pediatricians. M.S. Maslov combined the qualities of a brilliant clinician and researcher, which allowed him to create new pathogenic concept of childhood diseases and to offer on this basis, new approaches to their treatment. Numerous books of Mikhail Maslov, including "Fundamentals of studying children", "The diagnosis and prognosis of childhood diseases", "Clinical lectures on the faculty of Pediatrics" are reference books for several generations of pediatricians.

M.S.Maslov

A.F.Tour

The closest follower of Mikhail Maslov was Professor Alexander F. Tour (1894-1974). He started the way in pediatrics at the Department of the Military Medical Academy under the guidance of A.N. Shkarin and M.S. Maslov. Even in 1928, in collaboration with M.S. Maslov A.F. Tour released the first book "Nutrition disorders and digestive system of infants".

Since 1925 A.F. Tour worked at the Leningrad Pediatric Medical Institute, heading from 1930 the department of pediatrics at the hospital. He wrote the first book on children's hematology, physiology and children pathology of neonatal period, the textbook "Propaedeutics of childhood diseases", which went through six editions, "Handbook of dietetics of infants" was published 7 times, the monograph "Rickets" was published 2 times. During the WWII and the Siege of Leningrad A.F. Tour remained in the locked city, continued intensive medical, educational and scientific work. As the chief pediatrician of the Leningrad healthcare department he directly participated in all the institutional arrangements for the rescue and protection of children during the siege.

A prominent Soviet pediatric - infectious disease specialist Professor M.G. Danilevich, the author of the first "Guidelines for acute childhood infections," Professor N.I. Krasnogorskiy and N.I. Kasatkin, who studied the development of the higher nervous activity of children worked In Leningrad; Professor A.B. Volovik - author of the first Soviet book on heart disease in children and the first pediatrician, who began the clinical and immunological study of rheumatism. Furthermore, we should mention P.S. Medovikov (1873-1941), V.O. Mochan (1875-1943) and others.

In the prewar and postwar years pediatric schools were actively developing in Ukraine, Belarus, as well as the major cities of the RSFSR (Kazan, Yaroslavl, Gorky, Saratov, cities of Siberia and the Far East).

In Ukraine, the contribution to the formation of pediatric science was made by M.F. Rudnev, Y.N. Hohol, V.A. Belowusov et al. M.F. Rudnev (1874-1930) devoted his work studying the secretory function of the stomach and pancreas in disorders of food and different types of feeding, kidney disease, infectious diseases. A special role in the development of pediatric belongs to Y.N. Hohol (1897-1964), who has been successfully developing the questions of physiology and pathology of early childhood, nutrition. V.A. Belowusov (1895-1971) wrote a textbook on children's diseases, and made recommendations for the treatment of various forms of tuberculosis in children.

Development of pediatric science in Siberia is associated with the name of O.D. Sokolova - Ponomareva, created the Siberian pediatricians school; VK Menshikov, EM Lepsky and others successfully worked in Kazan.

In the development of pediatric science are important research institutes and the departments of pediatric health care institutions. In 1922 on the site of the former Orphanage in Moscow was built the "Home Guard for infants", later transformed into the Central Research Institute of Maternity and Infancy. In 1923, there are similar institutions in Kharkov, in 1925 - in Leningrad (now Pediatric Medical Institute), in 1926 - in Tashkent, Kiev, Baku, a little later there would be in Dnepropetrovsk, Minsk, Rostov Gorky and in other cities and countries.

Currently in our country there are many research institutes and many pediatric departments in medical institutions, which employ a large number of doctors and candidates of medical sciences researchers.

Of great importance to the intensification of pediatric research in our country has the opening of the All-Union Center for Mother and Child Health Protection in Moscow.

Pediatrics of last decades is extremely dynamic area of knowledge; growth of information, reviewing pre-existing points of view, the introduction of new methods of investigation and treatment occur with increasing speed. This is primarily as a rapid development of the fundamental theoretical sciences medical profile (physiology, biochemistry, genetics, immunology), and especially with the development of clinical presentations, accumulation and generalization of collective medical experience.

2. SYSTEM OF MOTHERCARE AND CHILDCARE

Before the Great October Socialist Revolution in Russia there was not any public child care. The first more or less precise data on the survival of children in 1845 is shown by the fact that only 367out of 1000 children survived to the age of 15 years, and in some regions of the country the number was even less. The causes of infant mortality, on the conclusion of the Botkin commission in 1886 were "intestinal infections, poor, incoherent, delayed feeding and a complete lack of care of children."

Infant mortality (number of deaths per 1000 births in the first year) in 1913 reached terrifying dimensions - 273. Known figure of Zemstvo medicine P.I. Kurkin wrote: "It can hardly be disputed that in a country where life is of low value in general so there cannot be highly valued a life of child". In whole Russia there were 23 children consultations, and they were mainly in large cities (Moscow, St. Petersburg, Kiev, and others.), and the total number of beds for children over 80 years of children's hospitals in Russia reached by that time only 750 beds. The extremely high mortality rate of women was in labor and mothers. This clearly illustrates the complete isolation of government in tsarist Russia from the children healthcare and healthcare of people in general.

In the draft of Program of the Russian Social-Democratic Labour Party, developed by Lenin in 1894 and confirmed in 1903 at the II Congress of the RSDLP, outlined the main provisions of maternal and child health. Yet the practical implementation of these activities began after the Great October Socialist Revolution. In November 1917, the People's Commissariat of State was created, as part of which was formed a special board, responsible for the development of urgent measures for maternal and child health. January 31 (February 13) in 1918, was published the corresponding decree in the development of which was attended by N.K. Krupskaya and A.M. Kollontai, and advised and edited by V.I. Lenin. It said: "All child serving large and small institutions of the Commissariat public charity, from educational buildings in the capitals to modest village creches, - all of them from the date of publication of this decree are merged into a single state organization and transferred to the jurisdiction of the Department of maternity and infancy, to form inextricable link with institutions that serve pregnancy and motherhood, to take from them and continue to perform a common task of the state on creating mentally and physically strong citizens"[1].

1 Resolution of the People's Commissariat of the RSFSR State Care for the Protection of infancy in the country. - In the book: Formation and development of health care in the first years of Soviet power. - M.: Medicine, 1966, p. 61.

From the first days of the Soviet state was launched targeted enormous scale of activities to create the world's first system of state aid to mothers and children. This happened in an atmosphere of civil war and severe devastation, when the government had to solve thousands of seemingly more important issues on which depended the destiny of the socialist republic. On the 6th day of the establishment of Soviet power signed the law on social insurance, according to which women are

guaranteed paid maternity leave and mothers have the right to be absent every three hours from work for breastfeeding. The party program adopted by the VIII Congress of the RCP (B), were identified targets for the development of maternal and child health. The basic principle of the development of Soviet public health was proclaimed - its preventive orientation. In February 1919,was founded the Council for protection of children under the supervision of Lunacharsky, formed a special children's funds, were organized free meals for children in schools and child care centers. Network of child care centers grew rapidly, expanded the network of children's hospitals.

VIII Extraordinary Congress of Soviets of the USSR adopted the Constitution of December 5, 1936, which contained a number of articles relating directly to health care, in particular to the protection of the interests of mothers and children. During World War II the Decree of the Supreme Soviet of the USSR "On increase of state aid to pregnant women, large families and single mothers, strengthening maternal and child healthcare, the establishment of the honorary title" Heroine Mother" and the establishment of the Order" Maternal Glory" and the medal" Motherhood Medal". In 1960, the Central Committee of the CPSU and the USSR Council of Ministers adopted a decree "On measures for further improvement of health services and the protection of health of the population of the USSR." Adopted at the XXII Congress of the CPSU Party Programme was further developed by concern for the health of the entire population.

The big event was the adoption of the session of the USSR Supreme Soviet on 19 December 1969 of the Union of Soviet Socialist Republics, the Law "On approval of the Fundamentals of Legislation of the USSR and the Union Republics on public health." During 1970-1971 legislation of the Union republics have been brought into conformity with this law. It was the next stage of improving legislation. Section V of the law was dedicated to maternal and child health.

In the new Constitution adopted in 1977 people's healthcare has been further developed, including legal, financial and moral support for mothers and children, including paid leave and other benefits for pregnant women and mothers.

Taking care by the Party and the government was demonstrated by the decree of Central Committee of the CPSU and the USSR Council of Ministers "On measures of further improvement of public healthcare" since 10/15/77. There was instituted the honorary title "People's Doctor of the USSR." A new manifestation of concern for the health of children and adolescents was the resolution of the CC CPSU and the USSR Council of Ministers "On measures to strengthen state aid to families with children" (1981). Was partially introduced the paid additional leave for mothers with the preservation of employment until the child is one year, as well as the right to receive additional leave without pay to care for a child until the age of 1.5 years, and in the future 2 years while maintaining continuous employment seniority and length of service in the specialty.

Most work was done by standing committees on labor and living conditions of women, maternal and child health at the Supreme Soviet of the USSR and the local People's Soviets.

At the moment the words come true and aspirations of one of the founders of our country's healthcare N.A.Semashko - the first People's Commissar of Healthcare, who already in 1926 said: "We need both hands to grasp the main link - the protection of mothers and children, and then we draw out the entire chain - improve the entire population. "

Currently, issues of Pediatrics are being studied in many research institutes and departments of medical schools and improvement institutes for doctors. Organization of research work was led by research councils in pediatrics and study committees, created by the Academy of Medical Sciences and the Ministry of Healthcare.

A major role in the coordination of research in the country on the implementation of scientific achievements in the practice of pediatrics, as well as the promotion of scientific research were carried out by the Union and republican scientific societies of pediatricians.

Healthcare system of mother and child in our country has developed over the years of Soviet power, it is one of the highlights of the social achievements of our society.

When a woman gets pregnant she had to register on record in the women's clinic, where she was required to be observed in the first half of pregnancy at least 1 time per month, in the second half - two times a month, but before delivery - every week. Here women were observed by obstetricians, gynecologists and therapists, and other specialists when needed. In case of deviations in health status or laboratory data is assigned to a treatment that can be performed at home or in special departments of hospitals with maternity wards or gynecological hospitals.

Data on pregnant women attended antenatal clinics were passed in children's polyclinics. A pediatrician or health nurses perform prenatal clinic (visit pregnant), which aims to teach the expectant mother to properly prepare children's play area or room, children's clothes for the child, to care for the future of the child. It is important to evaluate the family environment in order to establish the possibility of risk to the health of the child and determine the degree of activity of observing them.

After the birth of a child maternity hospital the woman was transferred to the corresponding notice in the children's clinic in the community, and in 1-2 days after the child's discharge the local doctor and a nurse visit them. This is the newborn nursing. It includes a thorough examination of the child; the study documents from the maternity hospital, an assessment of lactation condition in women and a detailed briefing on the techniques of breastfeeding and child care. In the first month of the child the doctor visits 3 times, and if necessary on a daily basis. Subsequently, the children's doctor observes the child once a month in the clinic: assesses the state of health, the dynamics of physical and psychomotor development, etc. Any deviation appointed by additional research and therapeutic measures. To assess the activity of the district the pediatrician to monitor the children of the first year of life entered the continuity factor surveillance, showing a number of children regularly (monthly) is observed. At every visit to the clinic the

mother had the opportunity to get acquainted with the room exhibition on education of the child, they need to receive advice on the regime, diet, selection of toys appropriate to the age and stage of development. An important aspect of the observation of healthy children is a choice of methods of physical training and hardening. Under the guidance of a doctor, and special nurses every mother can learn a set of exercises, appropriate to the age of the child, and do them in house hold regular sessions with the kid. In recent years, an important method of physical training and hardening was swimming for infants. This method became widespread in many cities of the country. Observation of healthy children and activities include preventing the occurrence of the most common diseases of children in the first year of life - rickets, anemia, eating disorders, as well as control over the conduct of preventive vaccinations. Premature babies and children who have suffered birth trauma, hemolytic disease, pneumonia or sepsis and other diseases, especially under the close supervision of the district pediatrician and head of the department. In addition, the first year of life of children is examined by a group of experts, which includes an orthopedic surgeon, neurologist and ophthalmologist.

Healthy children in the second year of life are observed by a pediatrician at least once a quarter, and in the third year - at least once per semester. Later medical examination is performed in children clinics annually. Children who attend child care centers are under the supervision of the district pediatrician and a physician of the institution.

Especially important are active preventive examinations with the assistance of various experts in preparation for the child to attend school. It begins with a 3-year-olds, that physicians cannot only identify existing disease in a child or developmental disorders, but also to ensure their early treatment. During this period, children consult a dentist, neurologist, ophthalmologist, otolaryngologist, orthopedic surgeon, and on the testimony and other specialists. Children, who are registered for some diseases, are examined thoroughly every year.

When calling the clinic at the emergence while the child has acute or chronic diseases district pediatrician decide on the possibility of treatment at home or need of hospitalization. If necessary, a doctor visits the patient at home on a daily basis; Sometimes the well-being of the child is observed by a nurse. At home can be performed various treatments. Control of recovery is usually performed when visiting the child clinic.

Currently, under the supervision of the district pediatrician are 800 children. Work of district pediatrician requires wide clinical outlook, ability to detect many forms of pathology. This can be helped by good knowledge of children, whom they watch a lot of years, and contact with their parents, as well as their trust. Effectiveness of preventive and therapeutic measures depends on the GP, as the forecast most of the diseases in children has a direct relationship with the time of their detection.

Doctors of childcare facilities are also included in the staffing of polyclinics. In nurseries and nursery groups of kindergartens one doctor serves 250 children, 700 children in schools, 2500 students. The function of the doctors of these

institutions also includes monitoring the health of children, identifying diseases and emergency care for acute illnesses and accidents. Additionally, the physician should organize the work of all the staff of institutions to comply with anti-epidemic regime, nutrition, mode of life, preventive vaccination, health education work with the non-medical staff and parents.

In the emergence of acute illnesses and disturbing parents the changes in the child's state they seek the help of a pediatrician at rescue service or call an ambulance. It is also very responsible units of care for children as well as in any severe violations of life effectiveness properly carried out urgent measures in children is always higher than that of adults.

The main volume of diagnostic and therapeutic work is carried out in children's hospitals. Children are sent to the hospital by planning, with references to pediatricians or extra-duty physicians of polyclinic services, emergency and ambulance services. Hospitalization of the child, as a result of which he is out of home, separated from loved ones, always causes him great mental trauma. This should be considered when determining indications for hospitalization, and to create hospital environment. Optimal for hospitalization of children is with preservation of maternal care.

Organization of children's hospitals must take into account that the vast majority of acute illnesses in children are infectious by nature and in the surrounding of children are highly contagious. In any case of infectious patients they should be separated from non-infectious ones. Therefore, children's hospitals in contrast to the ordinary hospitals should be able to maximize separation of children, which is achieved with a semi-boxed or boxed compartments system.

Departments of hospitals can be general, non-specialized and specialized. Development of specialized care has led to the creation of large hospitals offices like surgical, neurologic, otorhinolaryngology profile, as well as neonatal, cardiology, gastroenterology, allergist, nephrology, hematology, endocrinology and others. Pediatric hospitals greatly expanded their stationary facilities after creation in their departments or intensive care units. The doctors of children's hospitals diagnose or treat 20-25 patients, in addition, they are on duty at the hospital and check the children coming into the office. In recent years, the technique of so-called staged treatment of sick children became widespread. It can be presented as a three- or four-stage. In the first case acutely ill child or a child with newly diagnosed chronic disease enters the appropriate hospital, then is transferred directly from the hospital to a sanatorium of desired profile, and after the it the child is brought under the dispensary observation in the clinic. In a four-stage hospital system the child is transferred to another department of the hospital or another hospital, where is the stage of "regenerative" treatment, and only then sent to a sanatorium.

During the last two decades we have received priority development of various kinds of specialized children's health services. Most often, such a service is represented by the city, regional or national centers, having advisory offices or clinics to laboratories, hospital and sanatorium of corresponding profile. The local

pediatrician, who revealed a chronic disease in children, can send him for consultation and specification of the diagnosis in the center. If necessary, the child will be treated there. Therapy in a specialized service conditions is more effective than in the general wards.

Diseases of children are classified into different groups regarding the organ principle – bronchi-pulmonary diseases, heart and vascular diseases, etc., or by pathogenetic principle - allergic, tumor, infectious diseases, etc. Disease names are included in a unified international list developed by the World health organization (WHO). Currently we use IX revision of this list, held in 1975. In course of the disease it is to be classified to the group of acute and chronic diseases. The boundary between them is conditional and for a variety of diseases characterized by different terms. In general, acute diseases in children last from several days to several weeks and in rare cases - months, chronic diseases - from several months to several years, sometimes even a lifetime.

Quality of medical care is characterized by a number of indicators. One of the most important indicators is the infant mortality rate, i.e. the number of children who die before the age of 1 year in contrast to all children born alive in the course of the year. This indicator is usually calculated per 1000 live births. The infant mortality rate includes three indicators that reflect the mortality rate of children in different age groups:

a) early neonatal mortality rate - the number of children who died at the age of the first 6 days in contrast 1000 children born alive during the whole year;

b) late neonatal mortality rate - the number of children died at the aged of 7 to 28 full days in contrast with 1000 children born alive during the whole year;

c) post-neonatal mortality rate - the number of children who died at the age of 29 days up to 1 year (exactly11 months. 30 days) per 1000 children born alive during the whole year.

An important indicator of the quality of care for pregnant women and newborns is well accepted in the international and domestic statistics of perinatal mortality. It is the sum of stillborn children and children who died in the first 6 days in per 1000 total births (alive and stillborn) children. Infant mortality in our country during the years of Soviet power has decreased more than 12 times. Among its causes are currently the highest share occupied by disease of the newborn, followed by respiratory diseases, congenital malformations, and others. The main cause of death in children older than 1 year is injuries, less cancer and infectious diseases.

An important indicator of health care quality is also an indicator of disease. Incidence - is the number of newly emerged cases of the disease or diseases of this group over the past year, classified by the average annual number of child population per thousands. Due to the state's children healthcare organization system, its preventive orientation, and maximum availability of its approximation to the population incidence rate among children has been steadily declining. Poliomyelitis and diphtheria are almost eradicated. The incidence of pertussis only from 1960 to 1970 decreased by 16 - 20 times, scarlet fever - 2-3 times. The

incidence of tuberculosis and other infectious diseases has dramatically declined. The last decades are characterized by a change in the incidence structure of children, increasing the proportion of allergic diseases, diseases of the gastrointestinal tract, and diseases of the urinary and urine formation, hereditary diseases.

An important characteristic of each disease or group of diseases, as well as the efficiency of medical care is the mortality rate, which characterizes the number of deaths per 100 cases of the disease. In our country, due to the success of science pediatric mortality rates steadily declining for different pathologies. Practically there is no longer death in children older than 1 year in many infectious diseases, pneumonia and others. At the same time there are important tasks to reduce mortality in children under one year, and especially newborns.

The struggle for the further reduction of infant mortality and mortality today is the general line of the entire healthcare and especially obstetric and pediatric services. We need to intensify prevention efforts among children at-risk, improve the diagnostic and treatment process in clinics and hospitals, to improve continuity between examination and treatment clinics, hospitals and sanatoriums. It is expected to further expand rehabilitation offices. We need to work more actively for the prevention of diseases of children in preschool by vaccinations. Improving clinical examination of healthy and diseased children is the key to further improve the health of the younger generation.

3. PERIODS OF CHILDHOOD

As the child grows and develops constantly and at every stage of his life appears in a special morphological, physiological and psychological quality, there is a definite need to allocate in the process of human ontogeny the number of periods or stages of development. Among the stages of ontogeny there are the two most important: prenatal and postnatal development, or their own childhood. The prenatal period is primarily characterized by morphogenesis, which embodies a organogenesis various systems of the body, which manifests very abrupt and significant changes in the form and structure of organs when extremely intense and differentiated growing. Postnatal stage or own childhood, characterized by continued growth and improvement of the functions of individual organs and systems of the body as a whole, their integration and interdependence of the functional state. At the same time, the rate of development of individual organs and systems is very uneven (Fig. 1).

Even in the development of various organs and systems there is disproportion. For example, the speed of the left atrium is much higher than the corresponding figures of the right atrium. Uneven growth of individual systems in different age periods is observed as well. Thus, leg bone growth rate during the first physiological traction (5 - 6 years) is ahead compared with the growth rate of muscles, which is the cause of pain in the legs of children in this period of childhood. Therefore, the correct interpretation of the various clinical manifestations of imbalances is essential for the diagnosis of various diseases and to treat them.

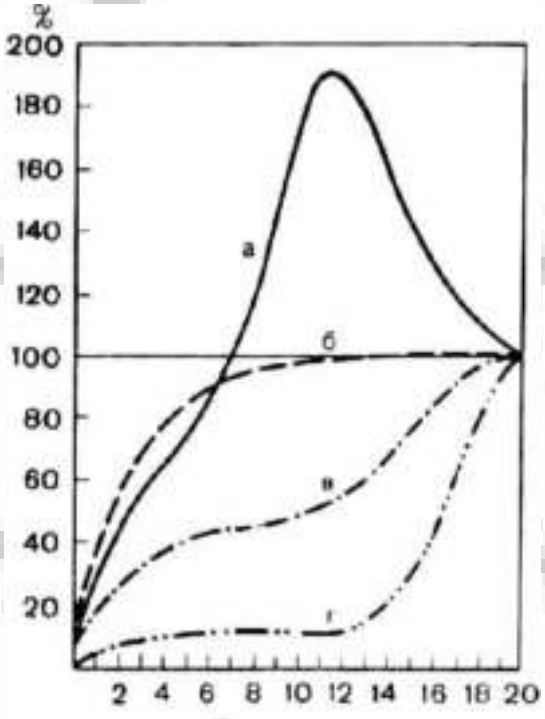


Fig. 1 The increase in the mass of various tissues and organs of children

а - lymphoid type: thymus, lymph nodes, intestinal lymphoid mass; б - neural type: the brain and its departments, the dura, the spinal cord, the visual apparatus, other departments of the head; в - common type: body as a whole, external part (except for the head and neck), respiratory and digestive organs, kidneys, aorta and the pulmonary blood vessels, spleen, muscle in general, the skeleton as a whole, the volume of blood; г - the genital type: testes, ovaries, the epidermis, the fallopian tubes, prostate, urethra, seminal vesicles. Age, years

Among numerous classifications of ontogenetic development of humans in pediatrics the most common and proven practice is the modified classification of N.P. Gundobin. The basis of periodization is histomorphological and functional features. The concept of period is to be communicated with the ideas about time interval delineated ontogeny, within which the particular morphology (organogenesis) and physiological functions are more or less mixed. In each period there is genetically determined maturation of the structures that provide particular functions that are typical for the respective age period.

Thus, important anatomical and physiological characteristics of each period are significant for the development of evidence-based medical, social and other measures of health and child's development. Therefore, periodization of childhood is important for specific medical practice and recommendations for appropriate modes of life, nutrition, education, disease prevention, and so on.

A. Prenatal Stage:

a) phase of embryonic development (II - III months);

b) phase of placental development (from III months until birth).

B. Extrauterine stage:

1) neonatal period (up to 3 - 4 weeks);

2) period of infancy (from 3 - 4 weeks to 12 months);

3) pre-preschool (senior nursery) period (from 1 year to 3 years);

4) pre-school (3 to 6 years);

5) primary school period (from 7 to 11 years);

6) high school period (from 12 to 17 - 18 years).

The demonstrated diagram of childhood does not contain the preparatory phase, which could include the formation of the parental gametes, characteristic to parents the phenotype of health and development and the whole background of the accumulation of gene pool represented in the gametes, since the pathology of fetal development begins long before fertilization. Practical value here becomes the sum of the data characterizing the probability of occurrence of hereditary diseases. Gametogenesis violations include sporadic or hereditary changes such as mutations and strictly non-hereditary lesions of gametes (sperm abnormalities or "overmaturity of genital cells"). Gametopaties can cause sexual sterility, spontaneous abortions, birth defects and hereditary diseases.

Violations of the formation of the sexual organs of women, diseases, kidney diseases and urinary tract (urogenital infections), as well as heart, respiratory, endocrine pathology, acute viral infections play no lesser role in the violation of pre-natal development of the child than gametopaties. Therefore, thorough medical

supervision for the health of girls and young men who are getting married is one of the most important factors in reducing perinatal infant mortality, reducing the number of children with congenital malformations.

Prenatal stage from fertilization to birth lasts an average of 270 days, but in practice, the calculation is usually carried out at 280 days (10 lunar months), starting from the first day through the last menstrual cycle in women. Derivatives are considered the birth deliveries occurring in the 37 - 41th week of pregnancy, premature - before the 37th week, too late - when the term of 42 weeks or more.

Nowadays are distinguished several periods of fetal development:

1. Germinal or proper embryonic period. It begins from the moment of fertilization and ends by implantation of formed blastocyst in the uterine lining. Its duration is 1 week.

2. The period of implantation. It lasts about 40 hours i.e. about 2 days. These two periods are sometimes combined, as medical and biological importance of them is large. At this time, 50 - 70% of fertilized eggs do not develop, and teratogenic factors, especially those related to a group of strong, cause pathology incompatible with the survival of the fetus (aplasia and hypoplasia), or form severe defects due to chromosomal aberrations or mutant genes.

3. Embryonic period. It lasts 5 - 6 weeks. Nutrition for an embryo comes from yolk sac. The most important feature is the tab and organogenesis of almost all internal organs of a child. Therefore, the impact of teratogenic factors (endogenous and exogenous) causes embryopathy, which represents the most serious anatomical and dysplastic malformations. Age of the fetus or gestational age from 3 to 7 weeks, is considered to be a critical period of development.

4. Neo-fetal or embryo-fetal period. It continues for two weeks, when the placenta is formed, coinciding with the end of the formation of most of the internal organs (except in the central nervous and endocrine systems). This period is important as the correct formation of the placenta, and therefore the placental circulation further defines the intensity of the growth of the fetus.

5. Fetal period. It continues from 9 weeks until birth. It is characterized by the fact that the development of the fetus is provided by hemotrophic power. In the fetal period, it is advisable to distinguish two sub-periods: early and late.

Early fetal sub-period (from the beginning of the 9th week until the end of the 28th week) is characterized by intensive growth and tissue differentiation of fetal organs. The impact of adverse factors generally does not lead to the formation of structural defects, but can appear stunted differentiation (hypoplasia) of organs or tissues infringement differentiation (dysplasia). Since the immune system is just beginning to take shape, the response to infection is expressed in connective tissue proliferative response, leading to cirrhosis and fibrosis. However, it is also possible the birth of immature, a premature baby. The totality of the fetus changes occurring in this period is called by general term - "early fetopathy".

Late fetal sub-period begins after 28 weeks of gestation and lasts until the onset of labor, i.e. until a discharge of amniotic fluid. Fetus in this period has no effect on the processes of formation of organs and tissue differentiation, but can

cause premature termination of pregnancy with a birth weight and functionally immature child. When maintaining the pregnancy the adequacy of fetal nutrition (intrauterine malnutrition) or general underdevelopment may occur, i.e. lack of weight and length of the newborn's body. A feature of the damaging effect of the infection in this period is of quite certainty of damage specificity, i.e. the appearance of already existing infection with the morphological and clinical signs of the disease, which is characteristic for a given pathogen. Finally, during late fetal period deposition process provides many food components which cannot be administered in sufficient quantities in breast milk for baby. Thus, the deposited calcium, iron, copper and vitamin B12 may maintain the infant's nutritional balance for several months. In addition, in the last 10-12 weeks of pregnancy, a high degree of maturity and protection functions of the vital organs of the fetus from the possible violations of oxygenation and injury during labors, and accumulated immunoglobulins at transplacental transfer of the mother provide a high level of passive immunity. In the last weeks of pregnancy maturation “surfactant” is carried, ensuring the normal function of the lungs and the epithelial linings of the respiratory and digestive tracts. Therefore, the birth of a child, even with a relatively low degree of prematurity is of very significant impact on its adaptive capabilities and the risk of various diseases.

Late fetal sub-period, of course, transforms into intranatal phase, which is calculated from the time of the appearance of regular labor contractions prior to ligation (clamping) of the umbilical cord (usually 2 - 4 and 15-18 hours). At this time it may cause injury of the central and peripheral nervous system, which poses an immediate threat to life. In addition, there may be severe violations of umbilical blood circulation or respiration. Birth injuries often occur due to inconsistencies size of the fetal head and the maternal passages, wrong fetal position (transverse, oblique, breech presentation) that require obstetric care. In many cases, the risk of vaginal birth makes obstetricians use fetal extraction operation by Caesarean section.

Describing the whole intrauterine development, it should be noted that along with the organogenesis stage this one is distinguished by rapid growth and accumulation of cell mass.

In 10 lunar months the transformation of a fertilized ovum into an embryo is accompanied by weight increases about 6 x 1012 times. Calculations show that if with such intensity accumulation of body weight continued after birth, adult body weight would exceed several times the mass of Earth. During pregnancy, fetal height increases by approximately 5000 times.

Terms of maturation and development are of paramount importance, since the nutrition of an intensively developing organism is due to the mother. At the same time, the developing embryo and fetus are very sensitive to adverse (teratogenic) factors that may cause the death (abortion, stillbirth), malformations of heavy, incompatible with life and of lighter forms and functional disorders, which can occur immediately after birth or later (sometimes after years and decades).

Currently the teratogenic factors can be divided into three groups:

1) exogenous;

2) genetic;

3) exogenous combined with genetic.

The exogenous teratogenic factors include ionizing radiation (more than 0.6 - 0.8 Tk), which causes the death of cells or gene mutation, a number of viral infections (rubella, to a lesser extent influenza, enterovirus infection, viral hepatitis, salivary gland disease and others.), pharmacological agents (cytostatics, steroids, salicylates in large doses et al.), some industrial and agricultural poisons, utility poisons (pesticides, herbicides, and among them, such as DDT drug), certain foods (especially damaged, for example potatoes, infected with fungus).

The teratogenic factors include genetic mutant genes that cause malformations with dominant or recessive mode of inheritance, for example, family cases with the splitting of the upper lip, poly- or syndactyly, and chromosomal aberrations (numerical and structural). If there are aberrations then malformations are often incompatible with living (60% of spontaneous abortions up to 3 months are caused by chromosomal aberration), and only a relatively small number of children (such as Down's syndrome, etc.) having a chromosomal aberration are viable. Combined teratogenic factors are made up of these two groups. For the formation of those or other malformations are important the terms of the effects of teratogens on formed fetal organs and systems (Fig. 2, 3).

After transection of the umbilical cord the second phase begins: extrauterine or childhood itself. Actually, childhood begins with the neonatal period, or the newly born period, which itself can be divided into early and late.

The early neonatal period is a period from the moment the umbilical cord ligation to the end of the 7th day of life (total 168 hours). This period is the most responsible for the adaptation of the child to extrauterine life. The most important physiological changes during the transition from intrauterine to extrauterine are the beginning of pulmonary respiration and functioning of the pulmonary circulation with overlapping paths of fetal hemodynamics (ductus arteriosus and patent foramen ovale), and an increase of blood flow in the vessels of the lungs and brain, as well as changes in energy metabolism and thermoregulation. Enteral nutrition of the child starts from this moment. In the neonatal period all functions of the body are in a state of unstable equilibrium, adaptation mechanisms are broken easily, which significantly affects the general condition of the newborn, and even its survival. In the early neonatal period there is a complex manifestation of the so-called hormone crisis of newborns, involving a violation of the relationship between the mother's and the child’s endocrine unit, as well as generic stress. In the first days after birth, as no other period of life, is important to intense and qualified surveillance by medical staff and the creation of special conditions to ensure the child's survival and adaptation.

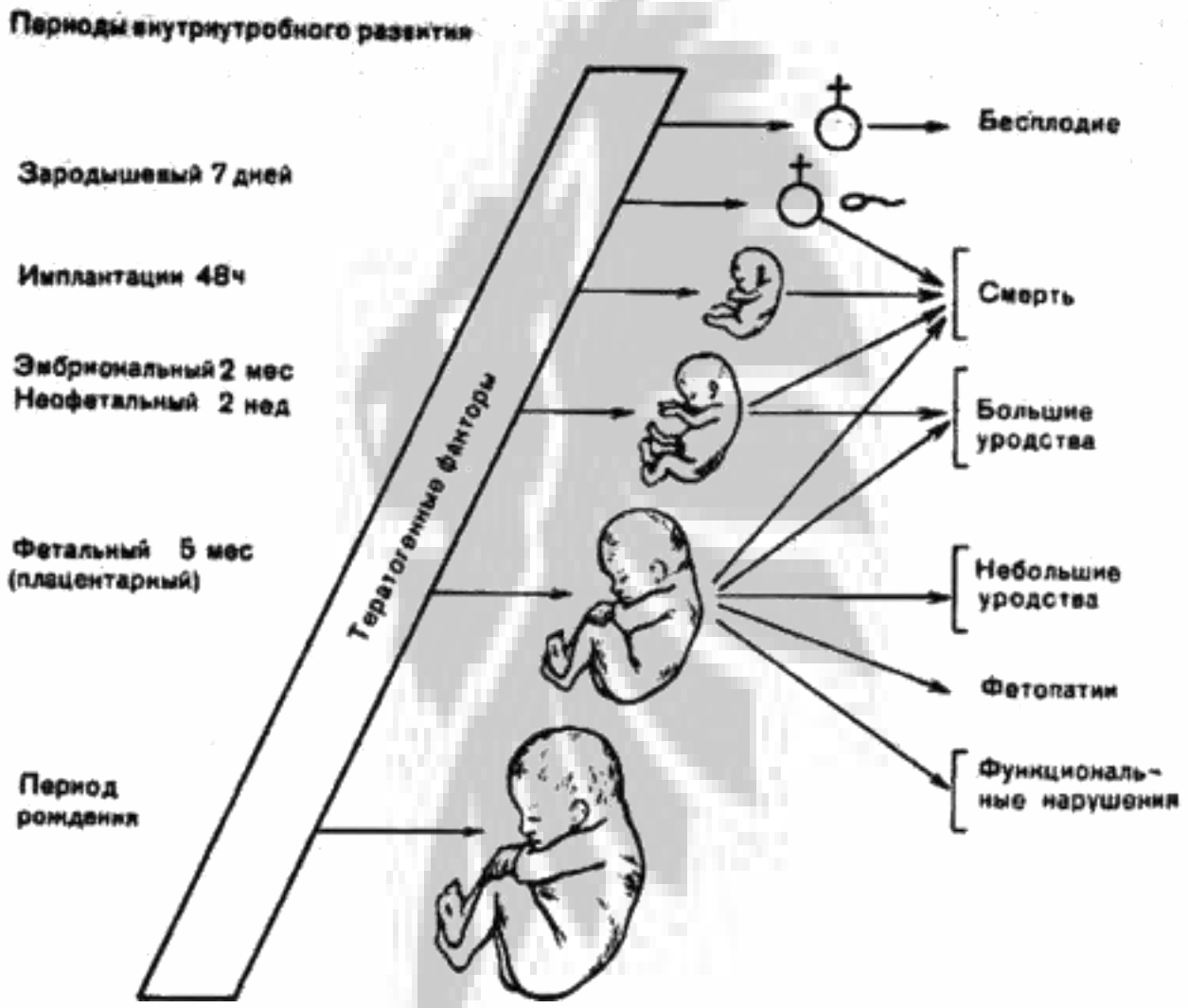


Fig. 2. Effects of teratogenic factors on the fetus.

The states reflecting the child's adaptation to the new conditions are physiological skin catarrh, physiological jaundice, physiological weight loss, urate infarction, genital crisis.

Diseases of the early neonatal period may be primarily due to disorders arising in earlier periods of development, i.e. in intrauterine or during labors. In this period, particularly, various anomalies of development are detected, as well as fetopathy, hereditary diseases and diseases caused by antigenic incompatibility of mother and fetus (hemolytic disease of the newborn for the Rh- and ABO incompatibility, etc.). To this period belong the manifestations of birth trauma suffered by intrapartum asphyxia, intrauterine infection or infection at labors, aspirations. Finally, in the early days of a child's life often arise purulence-septic diseases, pyoderma, some severe bacterial and viral intestinal lesions and respiratory tract.

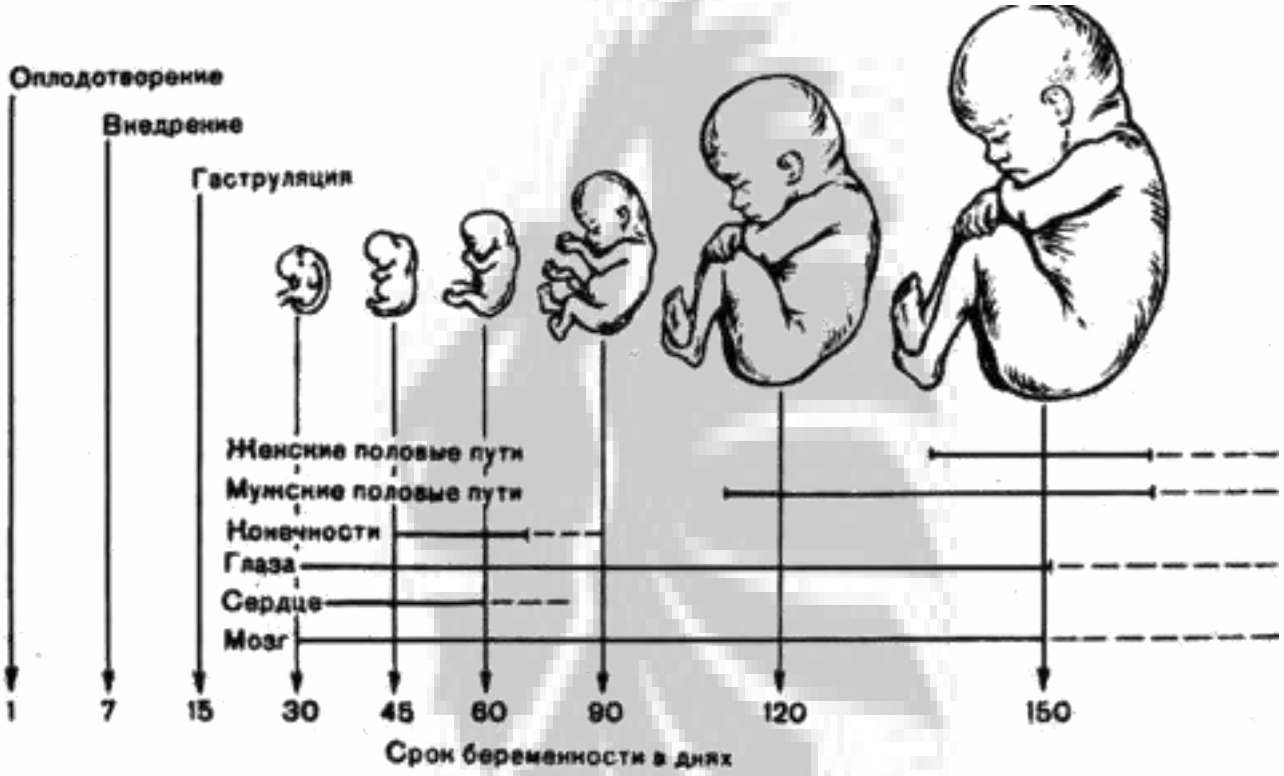


Fig. 3 Substantially dangerous periods of fetal malformations formation of various systems. Solid line - the highest probability of malformations; dashed line - smaller probability of deformity.

Getting easily infected is caused by immaturity of the first line of organism defense due to the absence of secretory A immunoglobulin, low consistency of antibodies belonging to class of M immunoglobulin (especially gram-flora) in newborns.

Emergence of so-called respiratory distress syndrome is of great importance, which occurs due to immaturity of the lung tissue at accompanied by hypertension of lesser circulation.

The first days of life are a kind of a critical period in the acquiring the skill of breastfeeding for the child as well as for the mother, in who lactation is developing intensively.

In the early neonatal period should be provided the aseptic conditions for maximum protection of the child from infection, the optimal ambient temperature (due to the unstable thermoregulation child), as well as close contact of the mother with the newborn, their mutual communication and habituation.

Because of the special importance and specificity of drugs and healthcare methods of the fetus and newborn, as well as the leading role of the mother's relationship with the fetus to ensure the normal development of the fetus and newborn and the pathology emergence usually occurs in such periods as late fetal, intrapartum and early neonatal, thus collectively it is called the perinatal period (from the 28th week of fetal development before the 7th day of life). The number of children who die in the perinatal period, virtually, equals to the number of deaths during the first 40 years of life. Therefore, the struggle for the maximum

preservation of the life and health of children in the perinatal period is the key to reducing overall mortality.

Late neonatal period covers 21 days (from the 8th to the 28th day of life). Healthy newborn in these terms is already in the house and comes under the supervision of the district pediatrician and nurse of the children's clinic. During this period various adverse moments easily cause disorders developmental, which primarily manifests delayed growth of body weight. The child's organism resistance is low and the full adaptation to extrauterine life has not happened yet. Therefore, in this period it is very important the systematic supervision of a physician and a nurse which is taken in the form of patronage at home. During patronage the state of lactation in the mother and the baby's sucking activity are observed, as well as weight gain, the mother and other family members are taught the techniques of care and feeding, observing of appropriate conditions for the child. Monitoring should be enough intense because in the late neonatal sub-period may also be revealed many diseases and conditions associated with the pathology of prenatal, intrapartum and early non-onatalnogo periods. This is primarily an infection, including intrauterine sluggish and acquired. Exactly at this age the clinical manifestations of umbilical sepsis often take place. The most important criterion is the welfare of the child's evaluation of the dynamics of body weight, nervous and psychological development, and state of sleeping.

The most important characteristic of this stage is the intensive development of analyzers, primarily visual, the beginning of the development of motor coordination, the formation of conditioned reflexes, the occurrence of emotional, visual and tactile contact with his mother. Around three weeks old, many children begin to respond to the communication like smile and facial expressions of joy. This first emotional contact of joyfulness many people consider as the beginning of the actual psychic life of the child.

After the neonatal period next comes infancy, that lasts from the29th day of life up to 1 year. The name itself emphasizes that, in this period of life the most cramped is the mother's contact with the child. The mother feeds her child. The basic processes of adaptation to extrauterine life have already been completed, breast-feeding mechanism has sufficiently formed and very intense physically, nervously -psychological, motor, intellectual development of the child take place. The maximum pace of physical development in the postnatal stage is accounted as 2 - 4 months of life. Throughout infant period the child's body length is increased by 50%, and body weight by three times. This growth rate is provided by a high metabolism with prevalence of anabolic processes. Relative energy requirement of children is 3 times higher than that of an adult. To provide such a demand, a child needs significantly more food per 1 kg of body weight. If such a need is preserved (per 1 kg of body weight) in adulthood, a person would need to get 10-12 liters of daily food. At the same time functionally the digestive organs still are not mature enough, which explains the frequent gastrointestinal disease in infants. Motor function dramatically improves: from total motor helplessness of the newborn to independent walking and manipulation of toys at the age of one year.

During this period, along with all this, there are a number of issues to ensure the optimal development of the child and prevention of diseases. This is primarily a problem of rational feeding, because feeding a child older than 5 months with only breast milk does not meet the child's needs. Therefore, it is necessary to promptly introduce corrective products or components. Inadequate nutrition in this age can be the cause of the delay of physical, nervous, mental and intellectual development. Bone tissue and blood system are exceptionally sensitive to food supply. The high metabolic rate explains its frequent disorder that manifests occurrence of rickets, and iron deficiency anemia. In addition, the permeability of the mucosa of the gastrointestinal tract explains easy penetration of food allergens into the bloodstream. This food sensitization is often manifested clinically by allergen-dermatoses.

The baby after 2 - 3 months loses passive immunity transmitted through transplacental to him from his mother, and the formation of their own immune system is relatively slow, and as a result, the incidence of infants is relatively high. Against anatomic-physical features of the respiratory system (the narrowness of the respiratory tract, immaturity acini and others). Infants often have bronchiolitis and pneumonia, for which is particularly heavy. At the same time, the lack of contact with other children, explains the relatively rare incidence of viral and drip childhood infections, despite their low resistance. To prevent the disease is set to individual home education for children of this age and versatile use of the tools and methods of tempering. These include massage, gymnastics and water procedures carried out by specially designed schemes. The most powerful tempering tool is the learning to swim of infant child. As a result of the constant contact of an infant with adults in the form of verbal communication is its psychological development.

Developmental disorders, revealed by examination of the child, are the most common signs of disease.

In infancy intensively preventive vaccination is carried out. Control of preparation of the child for vaccination and its implementation is also an important task for the pediatrician.

Pre-preschool (senior nursery) period is characterized by some slowdown in physical development of children, greater degree of maturity of the major physiological systems. Muscle mass in that period increases rapidly. By the end of the second year eruption of primary teeth is to be completed. There is an intensive formation of lymphoid nasopharyngeal tissues (tonsils, adenoids) with frequent hyperplasia. There is a typical morphological type - "the type of a small child" with his characteristic picture of body proportions, a round cylindrical body and limbs, rounded contours of the face and its shallow relief. Motor possibilities expand very rapidly, from walking to running, climbing and jumping. Motor activity is huge, and the adequacy of control of movements and actions of the minimum, hence greatly increasing the risk of injury. Knowing the external world is accompanied with various analyzers, including the receptor apparatus of the oral cavity (small items are taken into the mouth), so there is a high frequency of aspiration of foreign bodies and accidental poisoning. Out of the diseases the most commonly observed

ones are acute respiratory infections, due to the significant expansion in contact with other children on a background of incomplete maturation of the immune system. In the same period, most of the forms of allergic diseases including bronchial asthma take their beginning. This is the period of fast improvement of speech. Many of the children at the end of the 3rd year speak long sentences, with good grammatical control, convincingly argue. Starting from 3 years the child begins to say: "I", while before that he spoke from the 3rd person. This is the period of the first so-called stubbornness. The emotional life of the child of pre-preschool period reaches the highest degree of manifestation. Negative emotions can be in the nature of hysterical storms that reach affective seizures. There are manifestations of moodiness, shyness, surprise, fear. This is a period of learning work skills, implemented through the game. The personality traits and behavior are clearly defined. Teachers sometimes say that this is the period of "missed opportunities", referring to the wrong methods of education. Therefore, education is becoming a major element of childcare.

Preschool period (from 3 to 7 years) is the period when children attend kindergarten. This period is characterized by the first physiological traction, the growth of body mass slows down somewhat, clearly increases the length of the limbs, face has deeper relief. Gradually start falling out baby teeth and permanent teeth begin to grow. During this period, there is a differentiation of the structure of various internal organs. The immune defense is already reaches known maturity. During this period, intelligence develops rapidly; it is much more complicated labor activity. By the age 5, children are free to speak their native language, eating right declension and conjugation. Their memory significantly improves. Games become abstract. Coordinated movements improve, so can be seen in the development of drawing skills. The pronounced differences in the behavior of boys and girls actively begin, forming individual interests and hobbies. In girls, the game will be demonstrated in caring and in boys by the mobility and strength. There are complex relationships with different children and adults, self-esteem is formed. Emotional symptoms are much more restrained.

Out of the diseases in the first place by frequency are infectious ones, which are explained by the wide track of children, as well as respiratory diseases. However diseases in children of this period usually have a benign course. The main cause of death in this age is injuries.

In primary school age (7-11 years) there is a replacement of milky teeth to permanent; a clear sexual dimorphism of physical development has already begun. There are differences between boys and girls, both in the type of growth and maturation, and on formation of genital-specific body. Complex coordination movements of small muscle develop quickly, so skill of writing is to be possible. Memory improves, intelligence increases. Studying at school disciplines children, stimulates their autonomy and volitional qualities, expands the range of interests. Children begin to live the collective interests. However, the child spends now much less time in the air, often brakes diet, increases the load on the nervous system and psyche. At this age, the number of requests for medical assistance is minimal, but

as a result of special medical examinations there are revealed the children with vision changes, impaired posture, and dental caries. There remains a high incidence of infectious diseases as well as gastrointestinal, heart and allergic diseases. The number of children with excessive nutrition (overweight and obesity) increases significantly. The main cause of death in children is injuries.

Senior school age (from 12 to 17-18 years) is sometimes called adolescence. It is characterized by an abrupt change in the function of the endocrine glands. For girls it is a period of rapid puberty, for boys - the beginning. This prepubescent growth jump is distinguished with its usual disharmony, the emergence and development of features characteristic for the gender. This is the most difficult period of psychological development, the formation of the will, conscience, citizenship, morals. Often it is quite a dramatic revision of the whole system of life values, attitude towards themselves, their parents, peers and society in general. Here and extreme views, and extreme actions, the desire for self-assertion and conflict. Health of senior students also poses certain challenges towards doctors. They are characterized by disorders of physical and sexual development, instability of autonomic regulation with appearances sometimes difficult tolerated disorders of vascular tone. The girls can have thermoregulation violations. Eating disorders (obesity) and diseases of the gastrointestinal tract (gastritis, duodenitis, and peptic ulcer disease) are widely observed.

Each child has an individual pace of biological evolution and biological age may differ to some extent on the age of his peers. Many indicators of the organism functionality, its reactivity systems correlate primarily with the biological age, but not with calendar age. Features of each period are important for the creation of health measures and child development.

To determine the biological age of the child using an assessment of such features that reflect the process of biological maturation. For all age periods of childhood characteristics are used body proportions. In young children the biological age can be described in the development and disappearance of basic reflexes of newborns, the formation of motor skills, the appearance of milk teeth. In the preschool years an important sign of maturity is the appearance of permanent teeth, and in children of younger school age - the development of secondary sexual characteristics, performance dynamometry and physical performance. In special studies biological age is determined radiographically, the number of available points and ossification nuclei. In addition, all anthropometric, physiological, metabolic, immunological features with a clear and bright enough age dynamics can be used to determine the biological age of a child. If to have a table of age distributions of these features, it is considered that the biological age of the tested child according to this characteristic age period, when he refers within that range, typical to 50% of healthy children age-gender group.

4. PHYSICAL DEVELOPMENT OF CHILDREN

The growth rate, weight gaining, an increase in the sequence of body parts, and consequently, of proportions, as well as the maturing of various organs and systems at every stage, basically are programmed by hereditary mechanisms and under optimum conditions are vital for a particular plan. However, the adverse factors, particularly in utero and early in life, can not only break the sequence of the development of children, but sometimes cause irreversible changes. Environmental factors i.e. the conditions of supply, education, disease, social et al., may have a greater impact on growth than genetic or other biological factors, especially in a period of intense growth and development of the child. More clearly and simply we can evaluate the development of the child in various anthropometric indicators that have long been widely used in pediatrics.

The term "physical development" in Clinical Pediatrics is understood as a dynamic process of growth (increase in length and weight, the development of certain parts of the body, and others.) and biological maturation of the child in a particular period of childhood. Usually some physio-metric indicators are referred here too, and in young children (especially infants) formation of statistical and motor functions, which generally determines the performance or supply of natural forces.

Since 30-ies of the last century in the practice of medical examination of children were introduced anthropometric measurements, scientists noticed that in each decade the growth of children increases, and puberty takes place in them at an earlier age. This phenomenon is called acceleration (from Latin acceleratio -. acceleration). The younger generation as if competes with each other to see who will make their way from birth to adult status.

Acceleration process applies to all countries of the world, including our country. Not long ago, the archaeological research that has been conducted on the site of the famous Battle of Poltava showed that the growth of the soldiers during the time of Peter I was below the current adult an average of 20 cm. The body length of children under the age of 15, who lived in 1882 to 1970, had increased by 19 - 20 cm (Figure 4). Height of today's 7-year-old child corresponds to height of 9-year-old and 15-year-old height to 17-year-old boy who lived in the early XX century. This accelerated development also affected the prenatal period, as evidenced by the steady increase of the average length and weight of the newborn's body. In Western Europe the increase in adult height by 1 cm per decade has been observed for over 100 years. There is also a more rapid development of muscle strength, as evidenced by the ever-changing (increasing) world sports records, which are increasingly set by young men, not adult athletes.

The period of biological maturation also accelerated. This is evidenced by the earlier than a few decades ago, the time of appearance of ossification nuclei, dentition, the cessation of growth and puberty (Fig. 5).

At the same time there is some information on a more frequent distortions of the individual systems of the body (heterodynamous). It concerns the relationship

of the increase rate in the length of the skeleton and muscles of the cardiovascular and other systems.

Acceleration of development is probably due to changes in the genotype, developing as a result of high migration and the formation of mixed marriages. This is confirmed by the fact that, for example, the growth rate of children is directly dependent on the degree of remoteness of places of birth of his father and mother (Tanner et al.). Observations of J.J. Rapoport and co-authors showed that in the city of Divnogorsk, where the population is made up of residents of different regions of the country, children are larger than those of inhabitants of Kansk with a stable population. The geographical and climatic conditions of these cities are the same.

We cannot exclude the role of social conditions, as the acceleration is higher under optimal conditions for the development of children. For example, the rate of acceleration of children in developed countries is higher than in less developed ones, and among the urban population is higher than in rural. The real acceleration is accompanied by an increase in life expectancy and reproductive period of the adult population.

It is necessary to distinguish between the true acceleration from the accelerated development of children due to overfeeding (especially from protein). Typically, in contrast to the true acceleration the accelerated development of children when overfeeding (protein) causes the earlier maturation of biochemical systems (mainly enzymes) that actually reflects the violation of the course "biological clock" maturation. This may be the cause of rejuvenating the disease in adults (e.g. obesity, hypertension and coronary artery disease, diabetes, and others).

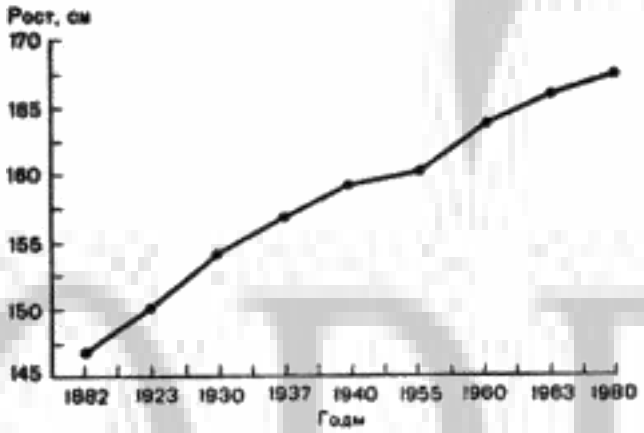


Fig. 4 Dynamics of body length of 15 year-old children 100 years ago

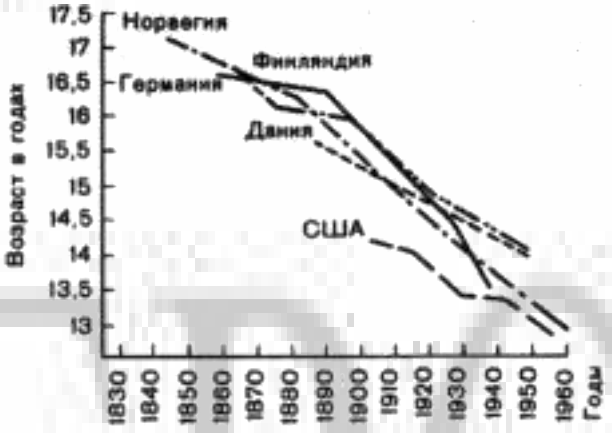


Fig. 5. Dynamics of ages when girls first had menstruation

In connection with the ongoing changes of the terms, the rate of increase in body weight and other indicators of physical development should be reviewed according to periodically standards that we have, and it is advisable to use the evaluation of the physical development of regional standards.

4.1 Fetal development

When prenatal (gestational) period of the child development, growth of length and body weight due to cell division (hyperplasia) occur more intensively. During the 40 weeks of fetal development occurs 44 successive cell division, which leads to greater weight in 6 -1 012 times. The same applies to the length, and the higher is the rate, the smaller the period of fetal development (for example, for only II month of fetal development fetus's length increases by almost 3 times).

The main factors governing and determining fetal growth are uterine blood flow and placental perfusion. Hypothalamus - pituitary gland, apparently has no influence on these processes, since during anencephaly or spontaneous decapitation fetal growth is not disturbed. Chorionic somatomammotrophin does not penetrate to the fetus. It is possible that the placenta among many produces a low molecular weight of peptides of growth factors. Thyroid hormones are also unlikely to be growth factors of the fetus; however, it was proved that their impact is necessary for the formation of neurons and glial cells in the brain. The most likely is the impact of full-length insulin and somatomedin. By the end of fetal development growth rate slows down. Usually increasing gestational age (prolonged pregnancy) does not affect the length of the body and only slightly effect on body weight. This is due to the occurrence of events at the end of pregnancy, "volume cessation", i.e. the inhibitory effect of a limited volume and elasticity of the uterine fetal development. Volume cessation is the mechanism, which forms an exemplary anatomical conformity of fetus sizes and ancestral ways of mother. Repeated pregnancies or abortion may lead to disorders of this mechanism due to reduced elasticity of the uterus.

The following empirical formula can be used for orienting judgments about body length depending on the period of fetal development:

Haase formula: fetal body length in the first 5 months of fetal development is equal to the square of the months of pregnancy; after 5 months the fetal length is equal to the number of months, multiplied by 5.

The body length of the fetus during pregnancy from 25 to 42 weeks equals gestational age per week + 10 cm.

To determine the fetal body weight following formulas are to be used. In terms 25 - 42 weeks: the mass of the 30 weeks fetus body is 1300, each subsequent week should be added 200 g, from every lacking cut 100 g.

To determine whether the weight and the length of the fetus are matching: the fetus of 40 cm length has a weight of 1300 g, for each additional centimeter of length of the body the weight should be increased by 200 g for every missing centimeter subtracted 100 g. Weight mismatch with the length of the body reflects the lack of pre-natal nutrition, or other adverse influence during pregnancy. More accurate indicators of body weight, depending on gestational age are shown in table 1 and figure 6.

Fetus bosom during gestation from 25 to 42 weeks equals to gestational age (in weeks) 7 cm.

Head circumference at 34 weeks of gestation is approximately 32 cm. For each lacking week it is necessary to subtract 1 cm, and at each subsequent add 0.5 cm.

According to these indicators it is possible to judge the actual age of the newborn. Often, the task of determining the appropriate length and weight of the fetus according to medical history gestational age are challenging for doctors, which is essential for the diagnosis, detection of high-risk disease of children with discrepancy. There are cases where the fetus dimensions correspond to the expected term of the pregnancy; fetus sizes are small relative to the duration of pregnancy; fetus sizes are large for gestational age. In addition, when comparing the weight and length of the body we can talk about the relative insufficiency (fetal malnutrition), or excessive weight for a given length of the body.

Таблица 1. **Масса тела при рождении в зависимости от срока беременности**

Срок беремен-ности, нед.	Масса тела при рождении, г				
	10%	25%	50%	75%	90%
24	530	660	840	1025	1260
25	605	740	880	1070	1035
26	685	830	965	1140	1360
27	770	925	1045	1220	1435
28	860	1025	1150	1340	1550
29	960	1140	1270	1485	1690
30	1060	1250	1395	1645	1840
31	1170	1380	1540	1815	2030
32	1290	1520	1715	2020	2280
33	1440	1685	1920	2290	2600
34	1600	1880	2200	2595	2940
35	1800	2130	2435	2870	3200
36	2050	2360	2710	3090	3390
37	2260	2565	2900	3230	3520
38	2430	2720	3030	3360	3640
39	2550	2845	3140	3435	3735
40	2630	2930	3230	3520	3815

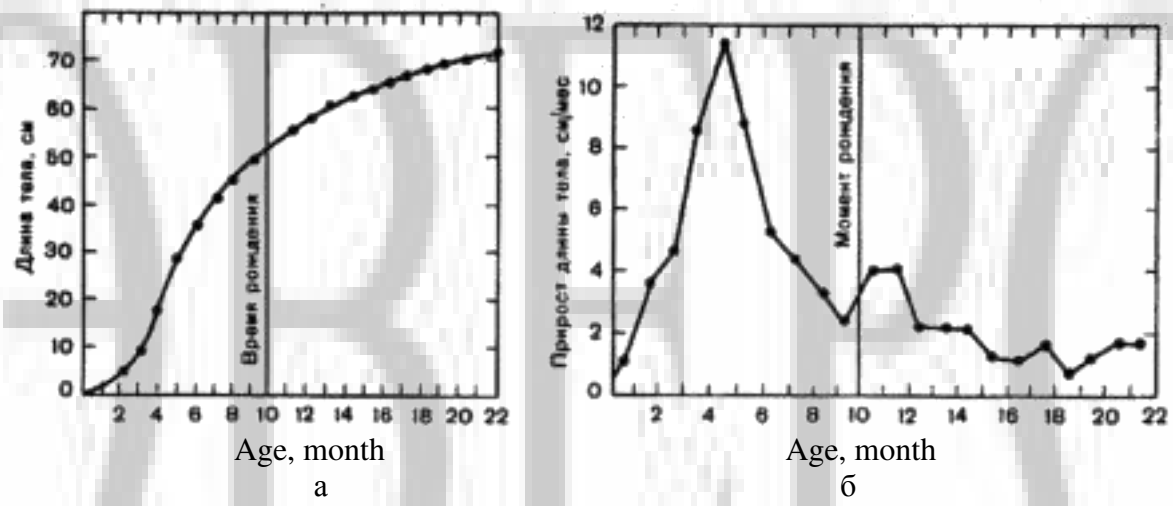


Fig. 6 Growth of body length (a) and growth rate (b) in antenatal and early post-neonatal period.

4.2 Growth after birth

After birth, the intensity of hyperplastic processes is reduced (there is a total of 4 consecutive cell divisions). At the same time hypertrophy of the cells are increasingly important for growth, mainly due to increase in the cytoplasm. A gradual growth slowdown takes place, accompanied by only occasional alternating of short-term acceleration. The growth rate has expressed craniocaudal gradient at which the lower body segments are growing faster than the top. For example, the foot is growing faster than the calves, and calves faster than thigh and so on. This affects the body proportions (see "Changes in body proportions"). In the postnatal period increases the sexual specificity rate of growth, when the boys grow faster than girls. However, the higher maturation rate is characteristic to girls. Therefore, a short period is an exception of the second extension in which girls outperform boys in growth.

The body length is particularly important, as it reflects the complex processes occurring in the body, in some measure the maturity level of the body. Body length of a full-term newborns ranges from 46 to 56 cm and the average for boys is 50.7 cm and 50.2 cm for girls. It is believed that if a newborn baby has a length of 45 cm or less, he is preterm.

In the early days the body length is slightly reduced, as after labors there is swelling on the child's head, which resolves within 2 days. Generic tumor size during the first measurement is typically included in the total length of the body of the newborn. Subsequently, there is a further increase in length. It should be emphasized that the younger the child, the more intense his growth.

The body length of the child in the first year of life can be calculated on the basis of monthly and quarterly changes in growth. In the first 3 months of life, growth increases by about 3 cm on a monthly basis or on a 9 cm for the quarter, in the II quarter of 2.5 cm, i.e. to 7.5 cm for the quarter, in the III quarter 1.5 2.0 cm, in the IV quarter by 1 cm per month, i.e. 3 cm, so the total increase in body length for the first year is equal to 25 cm. We can also use the following formula: a 6 months child has a body length of 66 cm; corresponding each lacking month should be subtracted value by 2.5 cm, each month after 6 should be added 1.5 cm. The length of the body of the child is now doubled to 4, tripled to 12 years. After a year the rate of growth begins to slow down. During the second and third year of growth increment up to 12 respectively 13 and 7 - 8 cm, and then become relatively uniform. The first acceleration of growth observed from 4 to 5.5 years in boys, and after 6 years in girls. Then the growth rate decreases, reaching minimum in boys 9.5 years old and 8.5 in girls. After that, boys experience moderate uniform extension of up to 13 years of age. Then re-start increase the growth rate to achieve a maximum in the range from 13.5 to 15.5 years, followed by a sharp deceleration.

In girls, the growth period is very short-term stabilization and six months later, i.e. from 8.5 years, it begins with a maximum acceleration at the age of 10 - 11.5 years.

The absolute value of gain in body length in time prepubertal growth increase in boys is up to 47 - 48 cm, in girls - 36 - 38 cm. Growing of boys at 10-11 years is solely due to the growth of lower extremities. Between 14 and 15 years legs stop growing and growth rate peak of the torus stars. In girls, these features are marked respectively at 8.5 and 11 - 12 years. Currently, growth is terminated at an earlier date than it was in the past. Cessation of growth, according to Tanner, refers in boys by the age of 17, 75 years, the girls - to the age of 16.25 years.

For approximate calculation of the length of the body in children a number of formulas can be used over 1 year.

At the age of 4 years, the child has a growth of 100 cm If age is less than 4 years old, then his height is 100 cm - 8 (4 - p), where p - number of years. If older than 4, the child's height is 100 + 6 (n - 4) where n - number of years.

The height of a child from 2 to 15 years is determined based on the height of the 8-year-old child, equal to 130 cm. On each insufficient year 7 cm is subtracted out of 130 cm, for each subsequent to 130 cm plus 5 cm.

More precise information about the length of the body of boys and girls older than 1 year are given in Annex 2.

In postnatal period the endocrine regulation of growth becomes important. Hormones that promote growth are the pituitary growth hormone (GH), thyroid hormones and insulin. Growth hormone stimulates chondrogenesis, while larger thyroid hormones affect the osteogenesis. GH acts on germ Cartilage indirectly. Active agents are the group of factors called somatomedins which are synthesized in the liver and possibly kidney GH influenced. Effect of growth hormone is relatively of little effect on the growth of a child up to 2 - 3 years, and is particularly high in the period from 7 to 11 years.

The greatest growth is determined by the effect of thyroxine in the first 5 years of life, and then in the prepubertal and pubertal periods. Thyroxine stimulates the osteogenic activity and increases bone maturation. Androgens, acting mainly in the prepubertal and pubertal periods, strengthen the development of muscle tissue, endochondral ossification and hondroplastichesky bone growth. The action of androgens as a growth stimulant is short-lived. Following the pubertal growth acceleration the androgens affect the closure of the epiphyseal growth areas and thus contribute to its termination. Inadequate time-bound appearance of androgenic stimulation (tumor or the use of hormones as drugs) causes early termination of the child's growth.

4.3 Body weight after birth

In contrast with height the weight is quite labile indicator which reacts comparatively quickly and is influenced by various causes - both endogenous and exogenous.

Body weight of a full-term newborn on average is 3494 g for boys, 3348 for girls. Permissible fluctuations in body weight at birth are considered to be 2700 - 4000, the newborn weighs 2500 g and it is considered as premature or born with intrauterine malnutrition, and with a mass of 4 kg or more as large.

Immediately after birth the weight of the child begins to decline somehow, i.e. there is the so-called physiological weight decline. The maximum loss is observed in the majority of children to the 3rd day of life and up to 6 to 8% of weight of body at birth, according to some sources, it is permissible up to 5%. Subsequently, there is a body mass regain, usually already at the 7th - 10th day of life. These changes in body weight are due to neonatal adaptation mechanisms. Loss of body weight mainly (70 - 75%) is due to perspiratio insensibilis due to water loss through the skin and lungs during breathing, desiccation of umbilical residue, release of meconium and urine. Thus, decrease in body weight is mostly due water loss, which to some extent due to disappearing hyperaldosteronism in a newborn, arising from aldosterone transplacental transfer from the mother to the fetus. In addition, in the first 1-2 days of life the baby gets a little milk, which depends on the state of the newborn due to labors, and the characteristics of the mother's lactation in the postpartum period. Starvation due to insufficient lactation of mother and suckling newborn can lead to the loss of some of energy of the active body mass - fat and glycogen. The prolonged feeding trouble of child may be responsible for a large (more than 8%) and the prolonged loss of body weight, which already tend to indicate pathology.

After the recovery the body weight begins to increase steadily, and its rate of increase in the first year is the faster (except for the first month of life) as the smaller age. For approximate calculation of body weight in the first year of life a number of formulas can be used.

Body weight can be defined as the sum of: birth weight 800 g x n, where n - the number of months in the first half and 800 g - average monthly weight gain during the first half year. In the second half of life the body weight is equal to: birth weight + weight gain in the first half (800 • 6) to +400 • (n - 6), where n - the age in months, and 400 g - average monthly weight gain for second semester.

The body weight of 6 months old child is 8200 g, 800 g is subtracted for each incomplete month and every subsequent month is to be added 400 g

A more accurate estimate of increase in body weight in infants in centile terms is given in Appendix 2. The rate of weight increase slows down after the first year. The approximate calculation of body mass in children older than one year can be carried out using the following formulas.

Child's body weight at the age of 2-11 years is 10.5 kg + 2n, where n - the age of the child up to 11 years, and 10.5 kg is average body weight of a year old child.

Child's body weight at the age of 5 years is on average 19 kg. For each incomplete year to 5 years 2 kg is subtracted, and each subsequent year is added 3 kg.

Body weight of children aged 12 to 15 years is: n • 5 - 20 kg, where n - the age of a 12 years old child or older.

The more exact weight indications of children older than one year are given in Annex 2.

Besides age standard, body length standards are widely used for the assessment of body weight. With the growth and maturation of the fetus the body

weight per 1 cm length of the body is constantly increasing. This pattern can be traced during the postnatal development of the child. Weight-length indicator is used as a criterion of maturity of the newborn (its rate is 55 - 65). Due to the large physical changes occurring after birth, approximate matching o length indicators and body weight can be determined by the following formulas.

For the first year of life: a child with a body length of 65 cm has a weight of 8000 g, on every missing centimeter of body length of 8000 g, 300 g is subtracted, for each additional centimeter of body length of 8000 g is added 250 g.

For children older than 3 years: a child with a body length of 125 cm has a weight of 25 kg; for every missing 5 cm from 25 kg is subtracted 2 kg, per every 5 cm over 125 cm to 25 kg is added to 3 kg, and for children of puberty period - 3.5 kg.

For a more accurate assessment are used the standards, formulated on an assessment of body weight according to length of the body within the age-gender group.

The practical task of assessing the length and weight of the baby's body is necessary to be implemented in two stages. Body length according to appropriate age scale standards of sigma or centile type is initially estimated. It is possible to tentatively decide to what age growth data are more typical and determine matches or mismatch of the length of the body and weight of the child's body. The relative lack of weight or its redundancy would indicate a lack of harmonious development.

4.4 Changes in head circumference

Observance of the change in head circumference is an integral component of medical control of physical development. This is due to the fact that the head circumference reflects the general laws of the biological development of the child, namely the first (cerebral) type of growth; In addition, impaired growth of cranial bones may be a reflection or even a cause of pathological conditions (micro and hydrocephalus). At birth, head circumference on average is equal to 34 - 36 cm. In the future, it grows quite rapidly in the first months and years of life and slows down its growth after 5 years.

Approximately, head circumference can be estimated using the following formulas.

For children up to 1 year: head circumference of 6 month old child is 43 cm for each missing month of 43 cm is necessary to subtract 1.5 cm, and for each subsequent to add 0.5 cm.

For children of 2-15 years old: head circumference of 5-year-old child is 50 cm, for each missing year of 50 cm is necessary to subtract 1 cm, for each subsequent to add 0.6 cm.

More accurate data on the circumference of the head is shown in Appendix 2.

4.5 Changes in chest circumference

The circumference of the chest is one of the main anthropometric parameters for the analysis of changes in the transverse dimensions of the body. Chest circumference reflects the degree of the chest, is closely correlated with the functional parameters of the respiratory system, and the development of the muscular apparatus of thorax and the subcutaneous fat layer on the chest. Chest circumference at birth on average equals to 32 - 34 cm. It is somewhat less than the circumference of the head; in 4 months these circumferences get equal, and then the rate of increase of the chest moves ahead than the head growth.

We can use the following calculation formula for a rough estimation of the development rate of the chest.

For children under 1 year old: chest circumference of 6-month-old baby is 45 cm for each missing month up to 6 it is necessary to subtract 2 cm from 45 cm, for each subsequent month after 6 to add 0.5 cm.

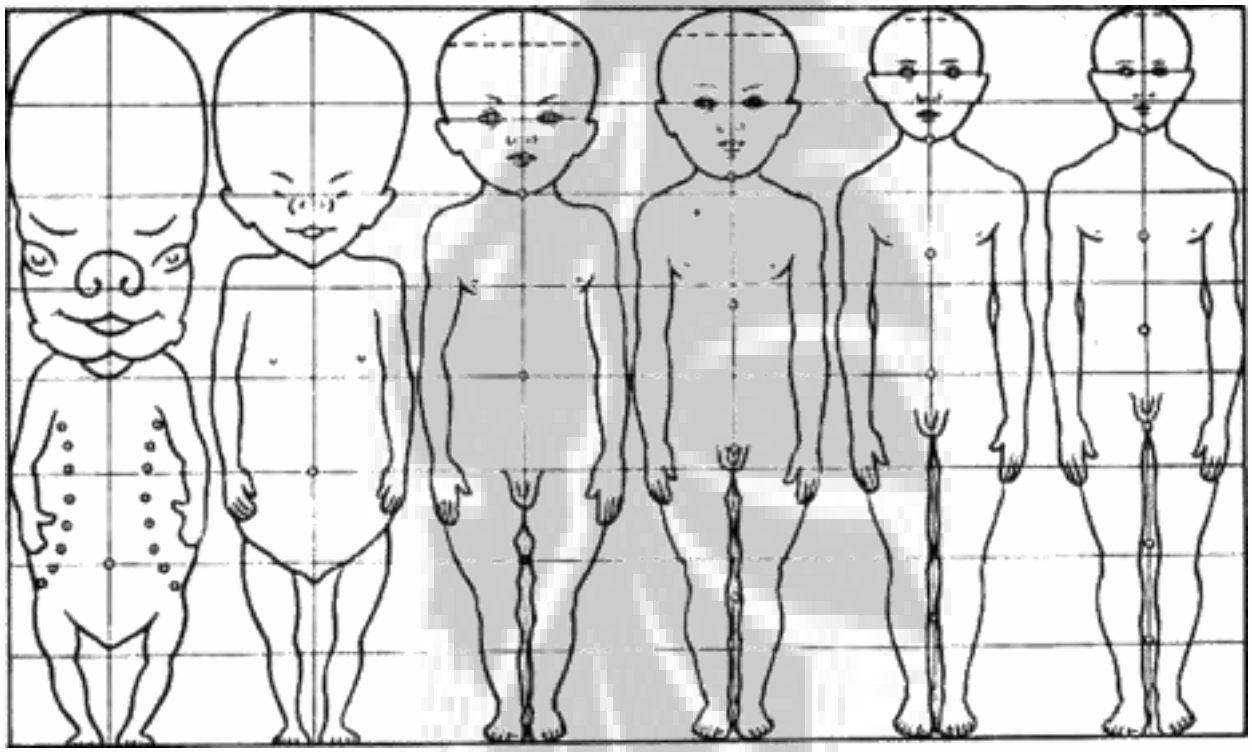
The circumference of the chest in children aged 2 to 15 years: a) for children up to 10 years: 63 cm - 1.5 cm (10 - n), where n - the number of years of a child younger than 10 years, and 63 cm is an average chest circumference of child under that age; b) for children over 10 years: 63 cm + 3 cm (n - 10), where n - age of a child older than 10 years, 3 cm - the average increase in chest circumference per year in children older than 10 years, and 63 cm - the average circumference of the chest baby at the age of 10.

4.6 Changes in body proportions

Body length changes according to age and it is characterized by varying degrees of elongation of different body segments (Fig. 7). Thus, the height of the head is increased only 2 times, the length of the body - 3 times, and the length of the lower extremities - 5 times. If the length of the body taken as 100%, then the overall height of the newborn's head will account for almost 25% of the body length, and in adults - about 13%; leg length of a newborn is 40% of the length of the body, and in adult - 52%. The relative constancy of different length of the body: in all age periods, it is about 40% of the total body length. The most dynamic changes in two segments is the upper part of the face and leg length. The sum of these segments is approximately the same in all ages and is about 60% of the body length, out of it in a newborn the upper of the face is 20% and legs are 40%, while the share of the upper face in adult is 8% and legs are 52% of the body length. Thus, the relative height of the upper face, as well as the relative length of the legs is sufficiently sensitive indicator of age-related changes in body proportions. During stunted growth from this data we can estimate the age, when this delay occurred.

Even more indicative characteristics of the age change of proportions value of the index, which characterizes the ratio of legs length to the height of the upper face. This index can be used to determine the degree of biological maturity of the child, the period of its biological development.

In practice, other indicators of proportionality are often used as well.



Embryo II months | Embryo V months | Newborn | 2 years old | 6years old | 12 y.o.

Fig. 7 The body proportions of children at different ages

The most widely spread is the definition of the upper and lower body segments relationship. To measure the lower segment the distance from the pubic point to the base of the foot (the floor) are used. The upper segment is defined as the difference between the body length and the value of the lower segment. In the first weeks of life, the ratio of segments is 1.7: 1 to 1.5: 1, in the period of puberty, growth is close to unity. The ratio between length (growth), measured in a sitting position, and length of the body in a standing position is widely used.

In addition to changing relationship between the body longitudinal axis, age-related change in proportions significantly affects the ratio between length and different transverse dimensions (for example, the relation between head circumference and body length, chest circumference and body length). By using different indexes understanding of the degree of harmony between body and biological child significantly refines. Tentative ideas about the harmony of body and the child's nutritional status can be obtained by using the Erismann and Chulitskaya indexes.

Erismann index is the difference between the circumference of the chest and a half body length (height). Most often used to control the physical development of schoolchildren.

Nutritional index (by Chulitskaya) is the following relationship: 3 arm circumference + thigh circumference + circumference of the tibia - the length of the body. In a well-fed infant the value of this index is 20 - 25. The decline of the index confirms the lack of nutrition.

4.7 The surface of the body

In all periods of childhood, especially in the first year of life, the child body surface per unit body weight compared with adults is relatively large. Thus, in the newborn per 1 kg of body weight there is 0.06 m^2 surface, while an adult has only 0.02 m^2. Especially great is the ratio of premature and immature children, and adults.

Roughly calculating the child's body surface can be implemented by the following formulas.

For children, having a body weight of from 1.5 to 100 kg:

$$S = \frac{4M + 7}{M + 90},$$

Where S - area of the body surface, M - mass. The numerator M is rounded to 0.25 kg, in the denominator – up to 1 kg.

For children from birth to 9 years: one year old child's body surface area is 0.43 m^2, for each missing month life of this value is subtracted 0.02 m^2, for each subsequent year is added 0.06 m^2. This calculation is used to determine the body surface of children from birth to 9 years.

For children of 10 -17 years:

$$S(м^2) = \frac{n - 1}{10},$$

где S - поверхность тела, п - возраст (годы).

Where S - the surface of the body, n - age (years).

To determine the child's body surface area are used special nomograms, which have the option of inputting parameters of the length indicators and body weight.

The ratio of surfaces of the individual parts of the body also changes with age. The most specific change (relative) is in the surface of the head. If the newborn's head takes up to 21% of the body surface, the head of an adult - only 7.5%. In the remaining parts of the body these changes are significantly smaller. Thus, the corpus is 32% in newborns and in adults - 35%, for the upper extremities it is respectively 17 and 19%, for lower extremities - 31 and 39%.

For children older than one year can be applied the following relationships ("rule of nines"):

Head and neck	-9%
Upper extremities:	
each	-9%
both	-18%
Lower extremities:	
each	18%
both	36%
Corpus:	
Front surface	18%
Back surface	-18%
Total surface	-36%

4.8 Method of anthropometric studies

Technique of anthropometric studies is unified and provides body measurement by standard measuring instruments.

Length measurement of body of children in initial 2 years of life is implemented in a supine position via a special-height meter board 80 cm long and 40 cm wide (Fig. 8). The side of the stadiometer is a centimeter scale, along which there is a sliding movable crossbar. The child is placed in the measuring board on the back so that his top touched the tightly fixed transverse bar of stadiometer.

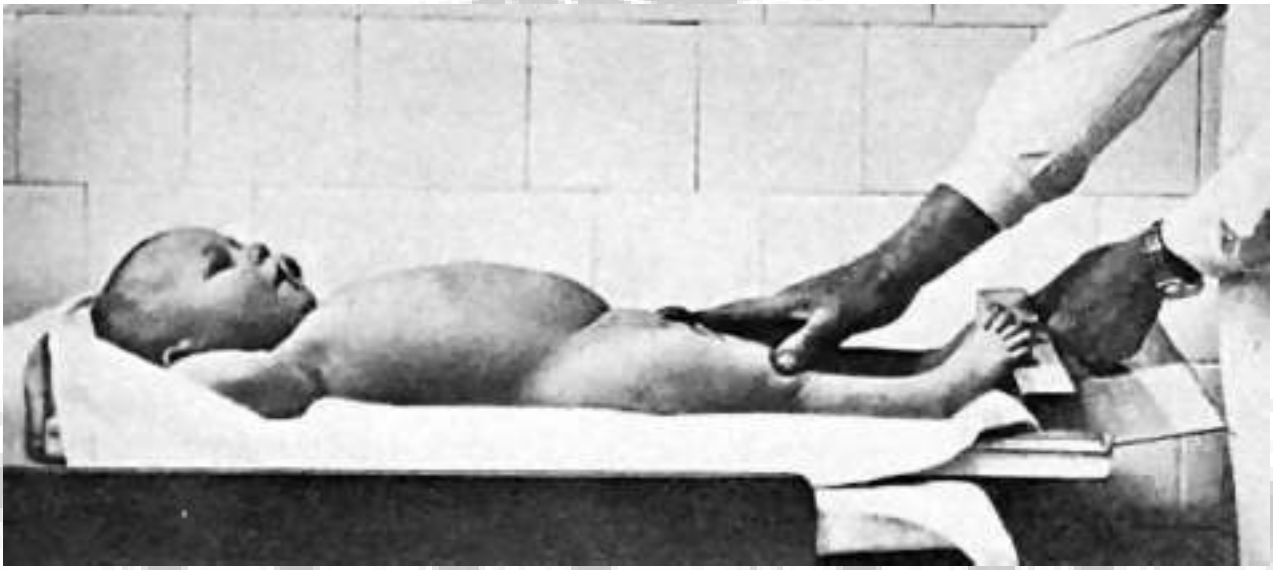


Fig. 8 Body length measuring of a child in the first year of life.

An assistant captures the head of the child in the position in which the lower edge of the eye socket and the upper edge of the external auditory canal are in the same vertical plane. Legs of the child are straightened by a slight pressure on the knees. The mobile bar of the stadiometer is tightly pressed against the soles of his feet. The distance between the fixed and movable slats corresponds to the length of the child's body.

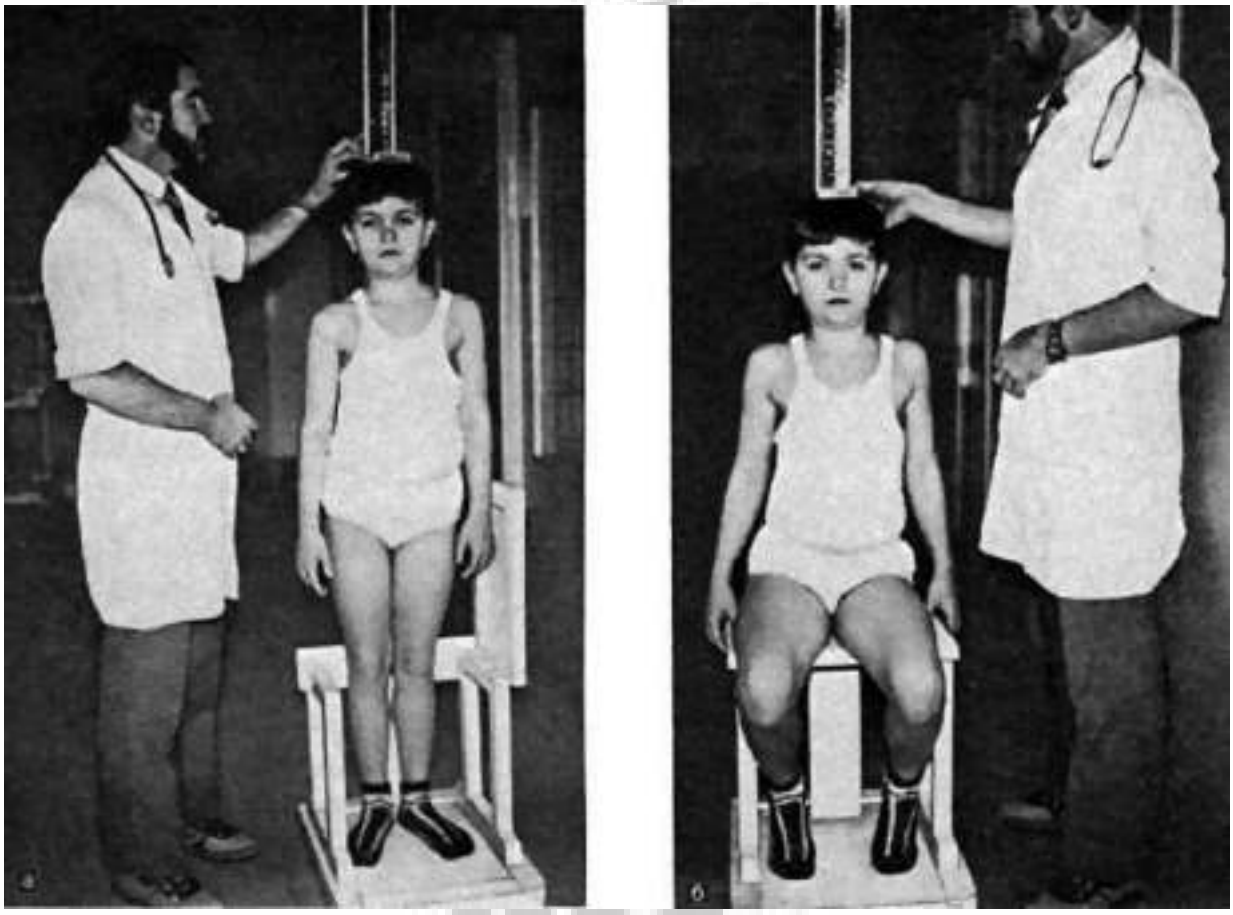


Fig. 9 Measurement of height in children older than one year:
a - standing; b - sitting.

The height of the older child is measured by using a vertical stadiometer with a folding stool (Fig. 9). On the vertical board of the stadiometer there are two scales: one for measuring the height of standing, the other to measure the length of the body (the height on sitting position). The child puts his feet on the ground with his back to the height meter scale. His body should be straight, arms hanging freely, knees unfolded, feet firmly shifted. Head is in a position in which the lower edge and the upper edge of the orbit of external auditory canal are in the same horizontal plane. The measured child should touch the scales with the back of his head, interscapular region, sacrum and heels. The mobile stadiometer strap tight, but without pressure touches the apical point of the head, after which the height is determined. The length of a sitting infant is measured after pressing the travel bar to the buttocks of the child. However, his legs are thrown over the bar. The height of an older child is measured by sitting, when he sits on a stool with his back straight and pressing the sacral region, back in the inter-blade span and neck to scale. His head is in the same position as in the measurement of the height in standing position; legs should be bent at the knees at a right angle. The height is determined by the travel bar scale for height measurement in sitting position.

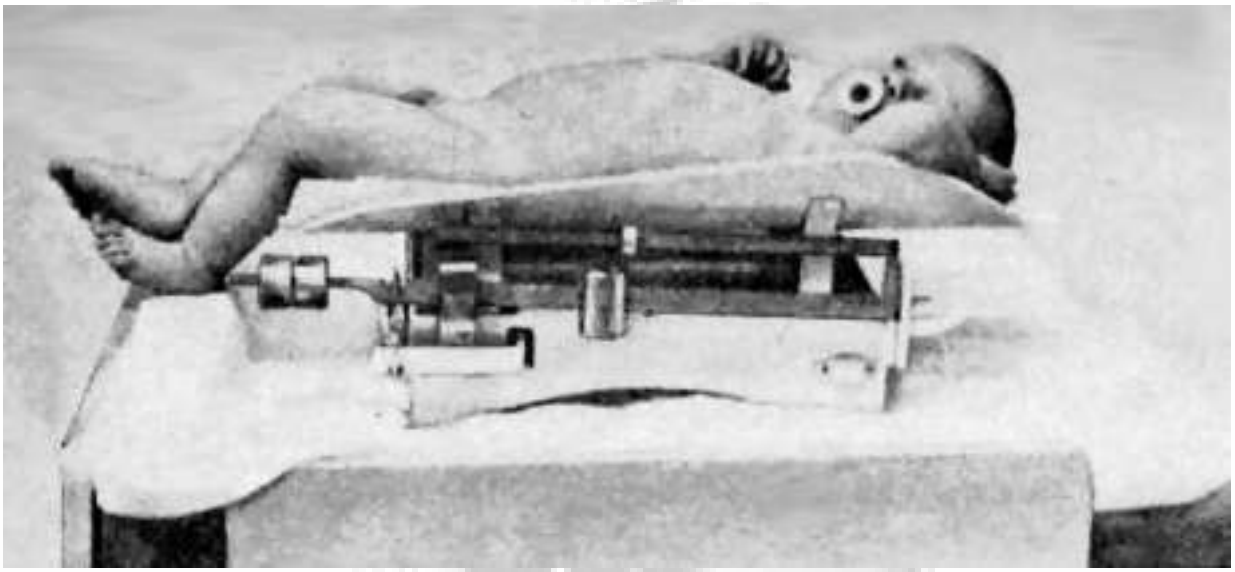


Fig. **10.** Determining the body weight of infants.

Body weights are determined on special children's scales with maximum load of 25 kg and measurement accuracy of up to 10 g (Fig. 10). Firstly, the diaper is weighed, then closed with a yoke on the scales and previously weighed diaper is placed completely undressed child so that his head and shoulder girdle were at the widest part of the tray, and legs on the narrow. If the child can sit up, then he can be put on the widest part of the balance, putting his feet on the narrow part. The weighting doctor stands right in front of the balance beam, with his right hand moving weights, and left one insuring the child from falling. Readings are taken from the other side of weights where there is the cut, the lower weight is placed only on available the lower scale of the nest. After recording the results the weights are put on zero, the rocker is closed and the child is taken away from the balance. To determine the child's body weight from the balance indications to be subtracted the weight of diapers.

Measurement of the mass of children at the age of 3 and older is held in the morning on an empty stomach in the special medical scales with accuracy up to 50g.

When measuring the height, at the same time, it is possible to measure the height of the head, which is a distance between the apex point (movable strip pressed against the head) and the chin point and determine the height of the upper part of the face - the distance between the apex and lower-nasal point, the midpoint of the body, for which the height of standing body is divided in half and the

Corpus length is the distance between the top of the sternum and pubic points, arm length - the distance between the shoulder and finger points, shoulder length - the distance between the shoulder and radial points, forearm length - the distance between the beam and the styloid radial points, hand length - the distance between the styloid and finger points, the length of the legs is equal to the height of standing trochanteric point above the floor, thigh length - the distance between the trochanter and the upper tibia inner points, shin length - the distance between the

upper-shin and lower-tibial internal points, foot length - the distance between the heel and toes end points. Schematic representation of the body's longitudinal axis is shown in Figure 11.

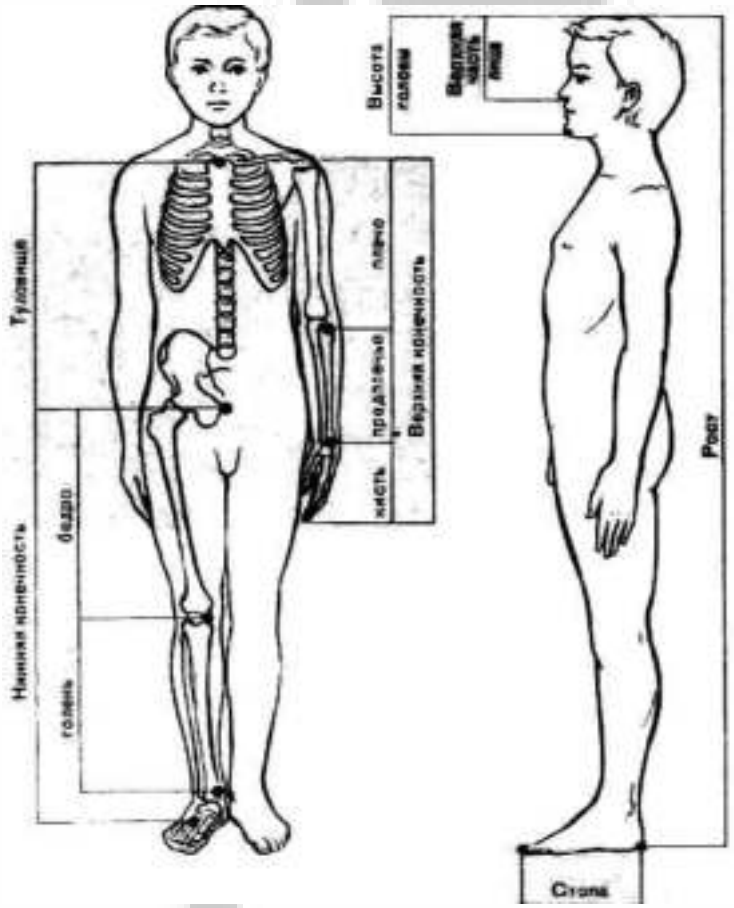


Fig. 11 Points for the measurement of various body parts.

Fig. 12 Measurement of head circumference

Circumference is measured with a tape. Head circumference is determined with overlaying tape, holding it from behind by the occipital point, and in front - on the brow ridges. Tape snapped in the direction of the right temporal area to the left and the result is determined on forehead (Fig. 12). The circumference of the chest is measured three times: during quiet breathing, at an altitude height of inhalation and exhalation. The child should be standing with his hands down. The measuring tape is applied under the rear bottom corners of the blades when the allotted towards the hands (Figure 13) then his hands are lowered and carried on the front tape mid-sternal point in girls during puberty with a well-developed breasts the tape is applied over the mammary gland at the transition from the skin on the chest gland.

Fig. 13 Measurement of chest circumference.

Abdominal circumference is measured at the navel level, while its significant increase - in the region of maximum protrusion.

Shoulder circumference is determined twice during tense muscles and relaxed muscles of the hand. Initially, the child's hand in a supine position, bend to the horizontal level of the forearm and put centimetric tape in place of the greatest thickening of the biceps muscle, then the child is asked to squeeze a fist and with maximum force to bend the arm at the elbow - make the first measurement, then, without removing the tape, makes the second measuring - in lowered free hand. This measurement is a key used in the calculations. According to the difference of the circles measured in tense and relaxed states of the hands we can determine the development of the biceps.

Hip circumference is measured by the horizontally applying the tape under the gluteal fold. The child in this case must stand with legs apart at shoulder width. The circumference of the tibia is determined at the point of maximum volume of the gastrocnemius muscle.

Measurement of transverse diameters and sizes is implemented by using special calipers. To determine the transverse diameter of the rib cage the leg of a caliper are set in the horizontal plane between the points, received at the intersection of the horizontal drawn through mid-sternum point, with the mid-axillary line on the left and the right. Anteroposterior diameter of the chest was measured in the horizontal plane between the mid-point of sternum and the spinous process of the corresponding thoracic vertebra.

The diameter of the head is measured by stoutly small compass. To determine the anteroposterior diameter one leg of the compass is fixed on the glabella, and the other is moved smoothly on the nape sagittal line to obtain the maximum size (up to the occipital point). The distance between the glabella and occipital point is the anteroposterior diameter of the head. Transverse head diameter is measured by setting the compass legs on the right and left parietal points at 1.5 - 2 cm above the upper edge of the auricle.

Shoulder (bisacromial) diameter is measured by a large compass, setting its legs on the shoulder points. Trochanteric (bitrochanteric) diameter is the distance between the trochanteric points.

When measuring the upper and lower segments of the body, the lower body segment length is considered the height of standing pubic point. The size of the upper segment is the difference between height and lower segment.

Stretching distance is the distance between the tips of the III fingers horizontally elongated and straightened in all joints of the hands.

Philippine test. To perform this test, the right arm of the child in the vertical position of the head is applied across the middle of the crown. During this, the fingers are elongated in the direction of the pinna. A child older than 5 years can reach his ears with fingertips.

Concomitant evaluation of different anthropometric characteristics, and sometimes parallel data evaluation of anthropometric and physiological studies are of particular interest for practice. With this purpose is used the method of "profiles" or "somatogram" (morfogram), which is a graphical representation of some attributes relative to the mean of these features expressed in sigma, centile or point ranking intervals. The scale of the deviation in percentage terms can be used as well. For young children Martin's profile is widely used, which includes the line connecting the point of equidistance of sigma or deviations of the measured values from the child age-gender of arithmetic mean. For girls of prepubertal and pubertal age the morfograms, including, in addition to body length and chest circumference, and even the sum of several measurements of the pelvis are used. This morfogram allows to identify disharmony of genital development of a teenage girl and take appropriate diagnosis and treatment measures.

4.9 Changes in length and weight

Taking into consideration the observed variation of the various indicators of physical development of the child, we have to know the so-called normal or Gauss-

Laplace distribution. The characteristics of this distribution is the average value of the attribute or metric (M) and the value of the standard deviation, or sigma (σ). Values beyond 2 M + σ standard for healthy children usually show pathology.

For most centile distribution the scale of 3, 10, 25, 50, 75, 90, 97% is used. The number of centile means feature limit indications are found in 3, 10, 25, etc., or respectively higher in 97, 90, 75 etc. percentages of healthy children. Signs beyond 3 and 97 percentile are regarded as pathological.

Typically, to assess the anthropometric measurements in clinical practice concepts of average is used, when the sigma deviation is ± 1 out of the average value, or when the result is within 15 - 85%; below average - the result is less than 1 - 1,9 σ, and 3 - 15%; above average - the result is greater than 1 - 1,9 σ, or 85 - 97%. For more accurate estimates is used the scale intervals in 7 (see appendix).

In practice, indicative estimates retain their value, where we should use the following empirical rule: random variation characteristic varying with age, usually not beyond one age interval; feature value may have pathological character if its value is in the range M + 1-2 of age range, and it can be taken as a sign of abnormal if it falls to values deviating from the child's age more than two age interval. Age intervals in standard tables are usually chosen by the following way: from birth to 1 year old the interval is 1 month, from 1 to 3 years is 3 months, from 3 to 7 years - 6 months, 7 to 17 years - 1 year.

Changes in basic anthropometric parameters (height and weight) are the basis for the detection of a wide range of adverse impacts as well as external (inadequate diet and mode of life), and of internal nature, in particular, a variety of chronic diseases.

In a large proportion of cases it is the deviation from the normal rate of growth and weight of increases are the first signs of the disease, obliging conduct of a comprehensive examination of the child.

Criteria for detection of growth retardation or weight gain can be divided into static (cross-sectional) and dynamic, obtained on the basis of two or more measurements at different time intervals. Dynamic criteria are more reliable. Therefore, in the practice of follow-up checking of young children anthropometric data are ascertained continuously, at intervals of 1 month in the first year and at least one semi-annually in the range of 1 to 3 years of life. Changes in body weight are faster and more susceptible to adverse factors than the changes in length. Therefore, in a particularly critical period of the life of a newborn or infant (illness, change of power) daily weighing is obligatory. The rapid drop in body weight is observed during infancy, most often associated with the occurrence of digestive disorders accompanied by vomiting and loose stools, insufficient introduction of the liquid, with water loss through the skin and lungs with shortness of breath and fever. Fast i.e. within 1-2 days drop in body weight of 10-15% of the original is often an indicative of acute dehydration of the child (dehydration or exsicosis).

Chronic nutritional and disease-causing abnormalities in the development of children usually lead to slower changes in weight and body length of them.

Probable stunted growth or weight gain should be warning if there are found insufficient increase in body length or weight for a certain period of time. The period of time for the body weight gain may be a child's first weeks of life of about 2 weeks -1 month, a minimum period of time the body length in the first year of life is1 month, from 1 to 3 years 3 months, later - 1 year.

When simultaneous assessment of the value of length and weight are based on the indicative comparison with the average values obtained from empirical formulas or from an updated assessment by the characteristic position in sigmal or centile line with the relevant conclusion of the "very low", "below average", "high", etc. The most extreme values of body length, going out of the M - 3σ or significantly less than 3 percentile boundaries, called dwarfism, or nanosomia; the values within the area from M - 2,5σ to M - 3σ - sub-dwarfism. Similarly, on the opposite end of the distribution there are located the sub- gigantism and gigantism zones.

Changes in body weight in children with greater sensitivity when assessing orientation are captured not to age, but to the child's body length (height). Depending on the degree of weight deficiency in children of 2 years of life first indicates malnutrition of I, II or III degree. During I degree malnutrition underweight body is 10 - 15%, II degree - 15 - 30%, III degree - more than 30%. Similarly, excess of body weight relative to the length of the child testifies to the presence of redundancy, in the first year of life it is called paratrophia. For children older than 1 year the terms "obesity" or "adiposis" are applicable. However, malnutrition of children can often lead to a delay in parallel length and body weight. In this case, there is a discrepancy of child’s height to age standards, while body weight and height ratio is relatively close to normal. This condition is called hypostatura for infants and alimentary sub-nanism for older children.

Hypostatura and other forms of pathologically short stature must be distinguished from the form of stunting, which has constitutional, usually hereditary nature. This form is sometimes called hypoplasia, and children suffering from it hypoplastics. In this case, the delay or lag of growth is often stated already from the first months of life in the absence of malnutrition or severe illness of the child, while motoric and neuro-psychological development is completely normal. Usually, the parents say that their children are growing slower than their peers.

Children with congenital anomalies of the skeletal system are a special group of short stature. This is usually easily recognizable forms of dysplastic or ugly dwarf. It is observed in achondroplasia, chondrodystrophy, periosteal dysplasia, spondee-epiphyseal dysplasia.

Pathological tall nature is less common than short stature. It is necessary to distinguish between transient forms of tall and tall, continuing until the end of the drawing period. Transient forms may include a greater length and body weight of fetuses in women with diabetes. Sometimes in the postnatal development there is temporarily boosted growth in children with hyperthyroidism or excessive production of androgens by the adrenal glands (congenital adrenal hyperplasia).

Gigantism in children, occurring in the course of postnatal development, can have a pituitary nature, i.e. determined overproduction of pituitary somatotropin hormone. In most cases, the cause of this overproduction is the anterior pituitary tumor.

A higher incidence of so-called constitutionally tall, having no pathological basis and quite typical for healthy children has become a relatively new pediatric problem.

Factors determining the physical development of children can be divided into genetic, exogenous and complex-classified.

Undoubtedly, genetic factors are the most significant. It is considered that there are more than 100 genes that regulate the speed and yield of human growth, but it is difficult to get direct evidence of their role. The impact on the whole heredity affects the physical development, especially the growth of the child after 2 years of life. Two periods are distinguished when the correlation between the growth of parents and children is much significant. This is the age from 2 to 9 years old when the action affects one group of genes (the first family factor), and between the ages of 14 and 18 when the regulation of growth depends on other genes (the second family factor). Hereditary factors determine the pace and limit of the possible growth of the child under optimal conditions of life and upbringing.

Effect of exogenous factors on the rate and limit of growth of children is better studied. The most important impact is considered to be food. Moderate deficiency of food delays the increase in weight and increases the growth and maturation, but the child's height cannot be reduced. The large degree of food deficiency is not compensated by an extension of the term and leads to short stature with a change in body proportions. Deficiency of certain food ingredients (vitamin A, zinc, iodine, etc.) selectively disrupts the growth of children. Redundant power supply, especially at an early age, also adversely affects the development process especially in the early childhood period. In such cases biological maturation can be accelerated.

Mode of life for child’s development is essential too. We can name the two most important factors modes affecting the physical development: the first - adequate physical mobility, which creates the degree of vertical and alternating the direction of the mechanical load on the skeleton, which is a stimulator of bone formation and cartilage growth and muscle development. Excessive vertical load, for example, when moving heavy loads, has the opposite effect that inhibits the growth. Therefore it is necessary to constantly monitor the child's mode of life, avoiding any hypokinesia or activities such sports or activities that may adversely affect his development. The second important factor is the lack of sleep. Exactly while sleeping all the major metabolic and cellular reorganization that determine children's skeleton growth develop.

The emotional state of the child - mental stress, depression, trauma, always leads to the inhibition of growth, which is due to the inclusion of neuroendocrine mechanisms that block the processes of growth and accelerating the catabolism.

Acute and especially chronic diseases can cause growth retardation of the child, since they break the anabolic processes for a long-term that cause the disorder of microcirculation and hypoxemia.

To the category of environmental factors can be attributed the influence of different climatic and geographical conditions. The hot climate and high altitude conditions have an inhibitory effect on growth, but at the same time can significantly accelerate the maturation of children. Growth rate fluctuations due to the seasons of the year are widely known (acceleration during spring and braking during the autumn and winter months). Growing season makes it necessary to build the evaluation of children growth rate based on the annual dynamics.

The effect of factors that go into the unclassifiable group on the growth of the child is the least studied out of all. These include such as the serial number of pregnancy and childbirth, the period of occurrence of births, fetal body weight (newborn) at the time of his birth, maternal age, and to a lesser degree his father, season of birth. The degree of their influence is relatively small.

In general, a child's growing trend is quite stable and is subject to the law of channeling, i.e. the rate conservation. Indeed, a variety of adverse effects of violating the child's normal growth rate may be subsequently neutralized by the phenomenon of "catching-up or compensating" growth, i.e. accelerated growth, coming after the elimination of the adverse effects. However, it is convincingly demonstrated that compensatory growth is observed not for all cases of stunting, and the mechanism of compensatory growth is significantly different from the normal that determines the temporary and incomplete recovery of growth in children who have had delays. This calls for the prevention of growth disorders in their early diagnosis.

Chapter II

ANATOMIC - PHYSIOLOGICAL CHARACTERISTICS OF THE CHILD'S BODY RESEARCH METHODS AND SEMIOTICS OF MAJOR INJURIES

5. THE NERVOUS SYSTEM AND NEURO-PSYCHOLOGICAL DEVELOPMENT

The nervous system, on one hand, coordinates physiological and metabolic processes in different tissues, organs and systems, and on the – it performs the role of communicator establishing contact of the whole organism with the environment. During ontogenesis different parts of the nervous system are integrated into a single functional system, the activity of which is improved with age and becomes more complex. The most intensive development of the central nervous system occurs in young children. Pavlov emphasized that the nature of the higher nervous activity is a synthesis of the factors of heredity and upbringing conditions. It is considered that the overall development of human mental abilities of 50% occurs within the first 4 years of life, 1/3 in the period of 4 and 8 years, while the remaining 20% - between 8 and 17 years. Since it is estimated that over a lifetime the average human brain learns in 1015 (ten quadrillion) bits of information, it becomes clear that it is at an early age carries the maximum load of information, and during this period the adverse factors may cause more severe damage to the central nervous system.

Aniage of nervous system takes place on the 1st week of fetal development in the form of medullary lamina, from which later neural tube is to be formed. Its front end thickens in the second week of fetal development. As a result of front of the neural tube growth in 5 - 6 weeks brain vesicles are formed, which later form the 5 brain parts familiar to us: 1) the two hemispheres connected with corpus callosum (telencephalon); 2) interbrain (diencephalon); 3) midbrain (mesencephalon); 4) cerebellopontine (metencephalon); 5) medulla oblongata (myencephalon), prolonged directly into the spinal cord. The back of the neural tube remains thinner and the spinal cord is formed from it. Further there is a complex shape evolution of separate constituent parts of the brain as well as the thin inner structure of neural tissue and structures.

The greatest intensity of the nerve cells division of the brain refers to the period from the 10th to the 18th week of fetal development, which can be considered as a critical period of formation of the central nervous system. Later, accelerated division of glial cells begins that lasts up to 2 years of the old child. If to consider the number of nerve cells in the brain of an adult as 100%, then at the time of birth of the child's brain has only 25% of formed cells, by 6 months of life they reach the range of 66%, and a year-old child has 90 - 95%. Different parts of the brain have their own patterns of timing and pace of development. Since the inner layer of brain vesicles increases much more slowly than the cortex, the excess growth of the latter leads to the formation of wrinkles and sulcus. The development of the cerebellum starts relatively late. The growth and differentiation of the

hypothalamus and cerebellum are most intense in the IV-V months of fetal life. The development of the cerebral cortex is particularly active only in the last months of fetal development. However, in the VI month of fetal development functional predominance of the higher parts over bulbospinal ones, is clearly identified.

The complex process of the formation of the brain does not end with birth. The brain in neonates has a relatively large size; large sulcus and convolutions are well expressed, but have small height and depth. Small sulcus is relatively few, but they appear after birth. The dimensions of the frontal lobe are relatively smaller than in an adult, conversely, the occipital part is bigger. The cerebellum is underdeveloped, and characterized by a small thickness, small size of the hemispheres and the surface sulcus. Lateral ventricles are relatively large and stretched.

In newborns gray matter is poorly differentiated from white. This is due to the fact that nerve cells are not only close to each other on the surface, but also arranged in large numbers within the white matter. In addition, there is practically no myelin sheath.

With getting older topographical position, shape, number and size of sulcus and convolutions of the brain change. Particularly intense this process is in the first year of child's life. In 5 years the development of the sulci and gyri continues, but much slower (Table. 2).

Table 2. **Comparative data of the circle, length of the hemispheres sulci, area of the cerebral cortex in children.**

Age	Hemispheres circles, mm	Length of sulci, mm	Square of cortex, mm^2
Newborns	323	5559	55822
10-11 y.o.	491	10325	189585
Times of increase	1.2	2	3.5

By the birth the child’s brain is a relatively large than body mass. There are given interesting indicators of brain mass to I kg body weight: 1/8-1/9 – in the newborn, in one-year old child -1/11 -1/12, in a 5 year-old child - 1/13- 1/14, in an adult - 1/40.

Thus, to 1 kg of the newborn weight equals to 109 g of brain substance, in an adult it equals to 20 - 25 g.

When growing, the brain mass increases rapidly (Table. 3). As it can be seen from Table 3 by 9 months the brain mass is doubled, by 3 years - tripled, then in 6 or 7 years the rate of growth slows down. The development of nerve paths and endings in utero period and after birth is centripetal in cephalosporin-caudal direction.

The process of differentiation of nerve cells is reduced to a significant increase in axon, their myelination, growth and increase of dendrites branching, the formation of direct contacts between the nerve cells (so-called interneural synapses). The pace of development of the nervous system is faster when the child

is smaller. It especially vigorously proceeds during the first 3 months of life. The differentiation of nerve cells is achieved in 3 years, and by 8 years the cerebral cortex is similar to the cortex of an adult by its structure. The development of the myelin sheath of nerve cells derives from the body to the periphery.

Table 3. **The average brain weight depending on the age**

Age	Avarage weight, g		Age, y.o.	Avarage weight, g	
	boys	girls		boys	girls
newborns	353	347	6-7	1313	1225
0-3 mths	435	411	7-8	1338	1265
3-6	600	534	8-9	1294	1208
6-12	877	726	9-10	1360	1226
1-2 y.o.	971	894	10-11	1378	1247
2-3	1076	1012	11-12	1348	1259
3-4	1179	1076	12-13	1383	1256
4-5	1290	1156	13-14	1382	1243
5-6	1275	1206	14-15	1356	1318
			19-20	1430	1264

Myelination of different paths usually occurs in the central nervous system in the same order in which they evolve in phylogeny, and their functional activity manifests itself in a similar manner and ontogenesis. For example, vestibulo path, which is considered as the most primitive, begins to detect myelination since VI months of fetal development, rubrospinal from VII - VIII months, and corticospinal - just after birth. The most intense myelination occurs at the end of the 1st - beginning of the 2nd year after the birth, when the child begins to walk. In general, myelination is completed only in 3 - 5 years of post-natal development.

However, in late childhood individual fibers in the brain (especially the cortex) still remain uncovered with myelin sheath. Finally myelination of nerve fibers ends in adulthood (e.g. myelination of tangential paths of the cerebral cortex by 30-40 years of life). The incompleteness of the process of myelination of nerve fibers determines the relatively low speed of the stimulation of them. Some authors even recommend prenatal determination of age in premature born children registration by speed of nerve impulse.

On the quantitative development of nerve endings are estimated on the content of acetylneuraminic acid accumulating in the area of formed nerve ending. Biochemical data indicate mainly postnatal formation of the majority of nerve endings.

The blood supply of the brain in children is better than in adults. This is due to the richness of the capillary network, which continues to develop after birth as well.

Abundant blood supply of the brain meets the needs of a rapidly growing nerve tissue in oxygen. Its oxygen demand is 20 times higher than the muscle's; moreover 3/4, 4/5 of the entire blood supply charges the gray matter. However, the blood flow to the brain in infants is somewhat different from the process in adults, since the diploic veins are formed only after the closure of the fontanelles. This creates an environment conducive to greater accumulation of toxic substances and metabolites in various diseases, which explains the more frequent occurrence of toxic forms of infectious diseases in infants. Also a large blood-brain barrier permeability contributes to this. At the same time, the substance of the brain is very sensitive to increased intracranial pressure. It is experimentally shown that an increase in cerebrospinal fluid pressure causes a rapid increase of degenerative changes in the nerve cells, and the longer the existence of hypertension leads to their atrophy and death. This is confirmed in children who suffer from hydrocephalus developing in utero.

Dura in neonates is relatively thin, adherent to the bones of the skull base over a large area. Venous sinus is thin-walled and relatively narrower than in adults. Soft and arachnoid meninges of newborn are extremely thin, subdural and subarachnoid spaces are reduced. The tanks, located on the basis of the brain, in contrast, are relatively large. Cerebral aqueduct (Silvio aqueduct) is wider than the ones in adults.

As the nervous system develops the chemical composition of the brain significantly varies as well (tab. 4). The amount of water decreases, the content of proteins, nucleic acids, lipoproteins (with gradual decrease of nucleoprotein level) increases. The latter process applies only on the white matter of the brain and reflects the processes occurring in it myelination. Lipids are 50% of dry mass of the brain. The total amount of lipids in the white matter of the brain is increased 3 times within the first year of life, and the amount of cerebrosides - 10 times; wherein the amount of lecithin is almost unchanged. Along with growing, there is a further accumulation of proteins in the brain tissue.

Table 4. **The chemical composition of brain depending on age (in% of weight)**

Composition	Fetus		Infants			Adults
	III mths	VII mths	1 mth	3 mths	8 mths	
H_2O	91.93	90.56	88.09	87.03	85.81	77.32
Dry residue	8.09	944	11.91	12.97	14.19	22.68
Fats	1.78	2.48	3.71	4.24	6.07	12.44
Phosphatides	1.04	1.24	1.91	1.74	3.17	5.68
Sulfatides	0.16	0.27	0.25	0.5	0.5	1.84
Cerebrosides	0	0.015	0.02	0.3	0.49	1.29
Cholesterol	0.58	0.97	1.53	1.7	0.91	3.63
Proteins	3.77	3.98	4.57	5.29	6.09	8.03

The spinal cord is more developed after birth of than the cerebrum. Thickening of the cervical and lumbar spinal cord in newborns are not defined and contoured after 3 years of life.

The rate of increase in the mass and size of the spinal cord is slower than the brain (Table. 5).

Table 5. **The weight and length of the spinal cord in children.**

Age	Boys		Girls		Age	Boys		Girls	
	Length, cm	Weight, g	Length, cm	Length, cm		Length, cm	Weight, g	Length, cm	Weight, g
Newborn	14	-	14	-	3 y.o.	21.2	13.0	20.9	13.6
1 mth	15	3.9	14.2	3.8	5 y.o.	24.9	15.7	22.9	14.8
2-3	16.5	5.0	16.0	4.6	7	27.2	18.9	24.7	18.2
4-6	17.2	7.1	16.9	6.12	Adults	45	26-28	42-43	26-28
7-10	18.4	8.2	17.5	7.5					
11-15	19.9	10.7	18.0	10.5					

As we can see from the table 5, a doubling of the spinal cord mass comes by 10 months and tripling by 3-5 years. The length of the spinal cord is doubled ny 7-10 years, and it increases more slowly than the length of the spine, so the lower end of the spinal cord is moved upwards with aging. This should be considered when choosing the level of performance of a spinal tap, when the substance of the brain is not damaged.

CSF study is widely used in clinical practice for the diagnosis of lesions of various membranes and brain matter. Total amount of cerebrospinal fluid increases with aging, and its pressure increases. The pressure is represented by the outflow speed of CSF at puncture (at a pressure close to normal, the fluid flows by rare drops of 20 to - 40 per minute). In the study of CSF it is important to pay attention to its color and transparency. The diagnostic importance is the determination of the protein content, amount of cell elements - leukocytes (cytosis), as well as the composition of cytosis (lymphocytes and neutrophils). The composition of the CSF has a number of features in children within first six months of life (tab. 6).

As we can see from the table 6, cerebrospinal fluid is transparent. The appearance of turbidity indicates pleocytosis. If the cytosis exceeds 600 per 1 mcl, then the cerebrospinal fluid becomes turbid, which is usually observed in purulent meningitis. Cerebrospinal fluid with random bloody mixture clearly stratified into 2 - 3 layers within half-hour in a vitro, so the top layer of meniscus can become crystal clear and bright. Cerebrospinal fluid, indicative of hemorrhaging in the shell and the substance of the brain, even after separation into layers maintains a uniform brownish color on standing.

Table 6**. Age-specific composition of cerebrospinal fluid**

Indicants	Children's age			
	Until 14th day	From 14 days to 3 mths	4-6 mths	Older than 6 mths
Color and transparence	Often xanchromatic, blood-tinged, transparence transparent	Colorless, transparent	Colorless, transparent	Colorless, transparent
Proteins g/l	0.4-0.8	0.2-0.5	0.18-0.36	0.16-0.24
Cytosis 1 mkl	3/3-30/3	3/3-25/3	3/3-20/3	3/3-10/3
Type of cells	Predominantly lymphocytes, single neutrophil	Predominantly lymphocytes	Lymphocytes	Lymphocytes
Pandey's test	From+to++	Up to +	Rarely +	-
Sugar, mmol/l	1.7-3.9	2.2-3.9	2.2-4.4	2.2-4.4

Cell content of 1 mcl (cytosis) is expressed in the "thirds", for example, pleocytosis - 80/3 or 80 "thirds". For a quick judgment of indicative increased amount of protein in the CSF the Pandey reaction is used. 2-3 drops of cerebrospinal fluid in saturated carbolic acid solution result in various turbidity degrees. Under laboratory conditions more detailed biochemical, bacteriological, virological and immunological study of cerebrospinal fluid could be held.

5.1 Unconditional reflexes of newborns

A child is born with a number of unconditioned reflexes, which can be classified into 3 categories: persistent lifelong automatisms; transient rudimentary reflexes, reflecting the specific level of development of the motor analyzer conditions and subsequently disappearing; reflexes, or automatisms, just emerging and therefore not always detected immediately after birth.

The first group includes the reflexes such as corneal, conjunctival, pharyngeal, swallowing, limb tendon reflexes, orbicular-palpebral or superciliary reflex.

The second group of reflexes includes: oral segmental automatism (sucking, searching, proboscis and hand-mouth), spinal segmental automatisms (grasping reflex, reflexes of Moro, support, automatic walking, crawling, Galant, Perez), myelencephal postural reflexes (labyrinthine, asymmetric and symmetric tonic neck reflexes).

The third group includes mesencephalic installation automatisms: labyrinth reflexes, simple and chain neck and trunk reflexes.

Evaluation of unconditioned reflex activity should be done in a warm well-lit room on a flat semi-rigid surface. The child should be awake, fed and dry. Damage irritation (except for special types of research) should not cause pain. If these conditions are not maintained the reflexes might be suppressed by the reactions to discomfort. Unconditioned reflexes are assessed in the position on the back, on the abdomen and in the state of the vertical suspension.

Proboscis reflex. When hitting with a finger on the lips of the child there is a reduction of circular muscles of the mouth, causing the lips proboscis extension.

Search reflex. When touching the skin in the corner of the mouth (in this case the lips should not be touched) occurs the lowering of lips, the tongue deviation and the head turn towards the stimulus. The reflex is particularly well expressed before feeding. It disappears by the end of the first year.

Sucking reflex. If to put a pacifier in the mouth of a baby, he starts to make active sucking movements. This disappears by the end of the first year.

Orbicular-palpebral reflex. If to effleurage with a finger the top of the arc orbit, the eyelid closure of corresponding side occurs. It disappears by 6-month.

Babkin’s hand-mouth reflex. The reflex is caused by pressure with your thumbs on the palm of the child near the tenors. The response is shown by opening the mouth and bending the head. It disappears by 3-month.

Grasping reflex. This reflex consists in grasping and firm holding by a finger, embedded in the child's hand. Sometimes it is possible to raise the child above the support (Robinson's reflex). The same reflex can be called up from the lower extremities, if to press down on the sole of the base of the II -III fingers; it causes plantar flexion of the fingers. It disappears in 2-4-th month.

Moro reflex. This reflex is caused by a variety of techniques: the child who is in the hands of a doctor, sharply lowered by 20 cm, and then raised to the original level; can be performed a quick movement to straighten the lower limbs or hit the surface, which has a child, at a distance of 15 - 20 cm on both sides of the head. In response to this action the child first removes arm to the side and extends the fingers, hands and then returns to its original position. Hand movement has the character of embracing. This reflex is preserved up to 4 months.

Reflex of Babinsky. Dashed irritation on the outer edge of the foot in the direction from the heel to the toes causes the rear extension of the thumb and other fingers plantar flexion, which sometimes diverge. The reflex is physiological up to 2 years.

Reflex of Kernig. The supine child’s one leg at the hip and knee joints is bent, and then tried to straighten the leg at the knee joint. With a positive reflex it cannot be done. This reflex disappears after 4 months.

Reflex of feet. The doctor takes a child's armpits from behind, keeping the index finger on the child’s head. Raised in such a position the child bends the legs in the hip and knee joints. Omitted on the support, it rests on it full feet, "stands" on bent legs and straight trunk. The reflex disappears by the second month.

Reflex of automatic walking manner. In the position of the support reflex the child is tilted slightly forward, while he performs stepping movement on the surface, without accompanying them with hand movements. Sometimes the legs are crossed at the level of the lower third of the shin. The reflex disappears by the second month.

Bauer's reflex of crawling. Child is laying down on the abdomen so that the head and torso are located in the midline. In this position the child for a few moments, raises his head and makes crawling movements (spontaneous crawling). If to put a hand under the feet of the child, these movements quicken, "crawling" includes hands, and he begins to actively push off feet from the obstacle, the reflex disappears by the fourth month.

Reflex of Galant. The doctor with his thumb and forefinger swipes the paravertebral lines in the direction from the neck to the buttocks of the child, lying on his side. Skin irritation makes arching of the torso open posteriorly. Sometimes this makes the legs bend and retract. Reflex disappears by the fourth month.

Reflex of Perez. In the prone position the child's neural spine spikes is swiped by fingers in the direction from the coccyx to the neck, which causes the deflection of the body, bending the upper and lower extremities, lifting of the head, pelvis, sometimes urination, defecation and crying. This reflex causes pain, so it is necessary to investigate this in the last place. It disappears by 4-month.

The body and head position effects on the muscle tone of newborn. This effect is mediated via the tonic neck and labyrinth reflexes.

Labyrinth tonic reflex. It is caused by a space change of the head. the tone of the extensors of the neck, back, legs is increased in the child, lying on his back. If he is flipped on his stomach, the tone of the flexors of the neck, back, legs increases.

Symmetrical cervical-tonic reflex. While passive flexion of the newborn's head, lying on his back, an increase in the tone of the flexors of the hands and extensors of feet happens. While extension of the head there is an inverse relationship. The change of tone can be judged by the increase or decrease of the resistance during passive extension of the limbs.

Asymmetrical cervical-tonic reflex. To test this reflex the child's head, lying on his back, is turned aside so his chin touches his shoulder. This decreases the tone of the limbs, corresponding the turned face (sometimes its short-term extension), and increases the tone of the opposite limbs. The reflex disappears by the end of the first year of life.

Trunkal rectifier reaction. When enjoining the feet of a child with the support straightening of the head is observed. This reaction is formed from the end of the 1st month.

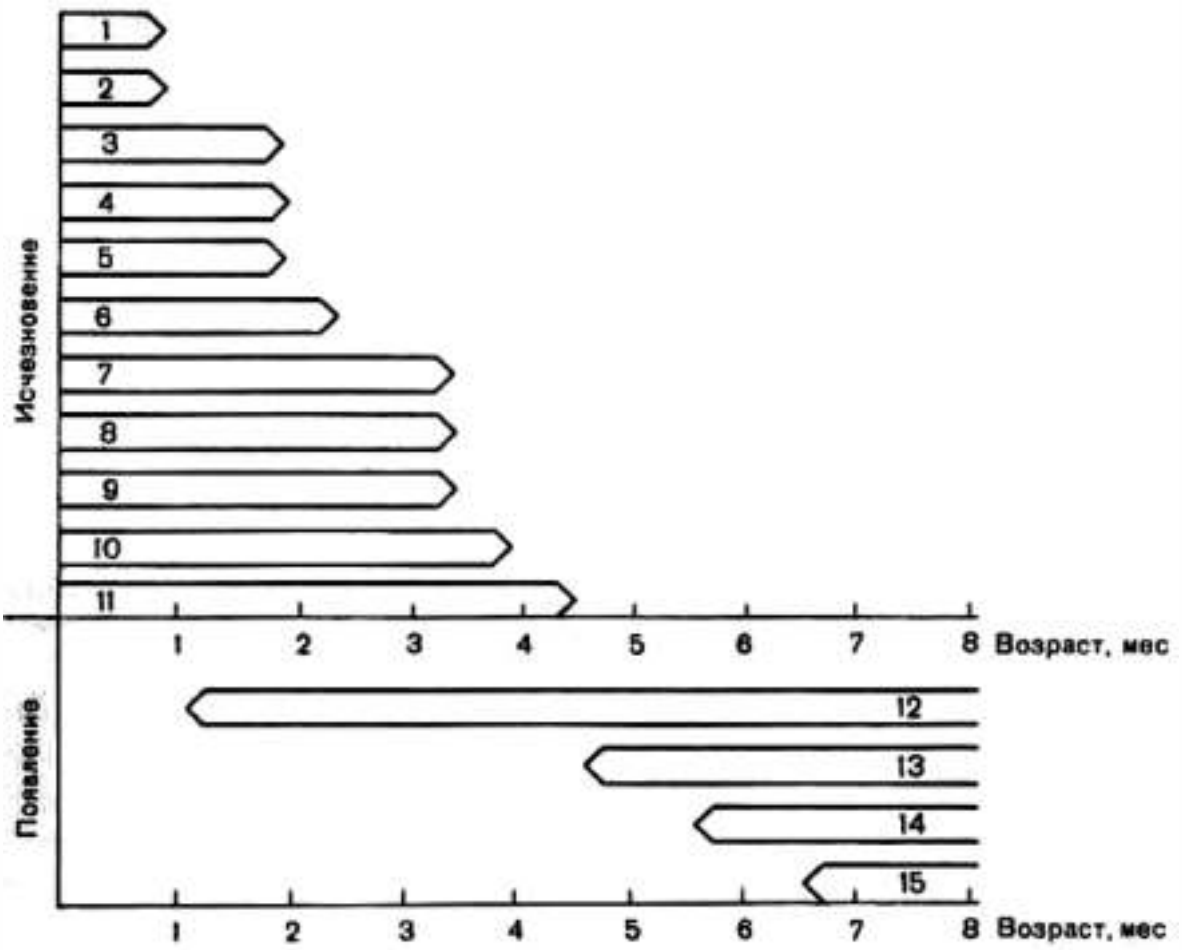


Fig. 14 Dynamics of main reflexes in infants (scheme)
1 - support reflex; 2 - automatic walking manner reflex; 3 - labyrinth reflex; 4 - asymmetrical cervical-tonic reflex; 5 - symmetric cervical tonic reflex; 6 - hand-mouth reflex; 7 - orbicular phenomenon (Galant reflex); 8 - reflex of Perez; 9 - grasping reflex; 10 – Bauer's reflex of crawling; 11 - Moro reflex; 12 - Trunkal rectifier reaction; 13 - upper Landau reflex; 14 - lower Landau reflex; 15 - chain cervical and trunkal reflexes.

Upper Landau reflex. The child in the prone position raises his head, upper part of the trunk and arms supporting the plane with hands and remains in this position. This reflex is formed by the 4^{th} month.

Lower Landau reflex. In the prone position the child extends and raises his legs. This reflex is formed by the $5 – 6^{th}$ month.

Simple cervical and trunkal righting reflexes. Turning the head towards the body causes rotation of the trunk in the same direction, not simultaneously, but separately: first the thoracic part rotates, and then pelvic. These reflexes appear from birth and get modified by the $5 – 6^{th}$ month.

Chain righting reflex from a trunk to the trunk. Turning shoulders of the child to the side rotates the trunk and lower limbs in the same direction, not simultaneously, but separately. Rotating pelvic department also causes rotation of the torso. This reflex is formed by the $6 - 7^{th}$ month.

Evaluating the results of unconditioned reflexes studies take into account the presence or their absence, symmetry, appearance time and decay, the power of

response and compliance with the age of the child (Fig. 14). If the reflex still exists in a child at an age at which it should already be absent, i.e. outside their age limit, it is considered as pathological.

5.2 Laws of physical activity formation

Development of motor sphere of the fetus and the child is one of the most striking phenomena of the age. The motor activity of the fetus in utero provides normal development and birth. So, proprioceptors and skin irritation receptors ensure the timely appearance of a specific "fetal" posture, which is the least amount of posture with minimal internal pressure on the uterine wall. This occurs even when bearing out pregnancy while the fruit size is fairly large. Labyrinth motor fetal reflexes contribute to the retention of strict provisions for future optimal delivery, i.e. cephalic presentation. Finally, a number of motor reflexes formed in utero, will be of great help to the fetus and his mother during the critical period for them – during childbirth. Reflex turns of the head, torso, legs pushing away from the uterus - all this certainly contributes to prosperous labors. This is called a spinal level of reflex activity.

After birth, due to morphological and anatomical features of the brain the type of movement in children is different from the motor development in young animals. Comparing both types suggests that the greater role is played by the cerebral cortex in the development of the movement, the less organized the motor skills of newborn, the longer its development period, the more complex and diverse gets the movement of the adult organism.

Finally, the ratio of the time of receptor function and motility of the child is different from that of young animals. So, the brain child cortex becomes active around the middle of the first month of a child's life, as evidenced by conditioned reflexes, which are available at this time. However, even a two-month movement of the child is still very imperfect.

The majority of animals in the development of a sequence of movements and activity of receptors is quite different: their movements are already arranged at the time of birth, or are formed before formation of conditioned reflexes with higher analyzers like auditory and visual.

Thus, in the child first higher analyzers begin to function and only then complex locomotor acts develop that require complex coordination. This rule is of great practical importance and highlights the need for training in a specific sequence of movements.

By birth the subcortical structures of the motor analyzer, integrating the activities of the extrapyramidal system are formed. This level, according to Bernstein, is called thalamo-pallidal. Movements of newborns are chaotic, generalized and athetosis-like character, unfocused, observed with muscular hypertension of flexors predominance. Coordination of movements in children begins to develop after birth. This level of organization of movements is called pyramidal striatal. Initially coordination of eye muscles is formed, which is

manifested in the child at 2-3 weeks in the form of fixing the gaze on a bright object, and then watching a moving toy held high above, turning his head, that already indicates the beginning of the development of coordination of movement of the neck muscles. For 11/2 months the child begins to hold his head. Then, coordinated hand movements begin to develop. This is the approach of hands to the eyes and nose, rubbing them, and a little later a raise of hands over the face and their thrall. From 3 - 31/2 months the child begins to feel his hands, fingering the edge of the blanket and diapers. Now smaller toys are necessary, hung low in the bed, above the level of the lying child. During this period purposeful movements begin to form. Initially, the child begins to hold the toy with both hands, and then gradually begins to make efforts to actively seize an object with hands (12 -13th week). Only from the 5th month the child's drawing hands and grasping the subject begins to resemble a similar movement to adults'. However, even here there are a number of features indicative of immaturity of the motor act. First of all, this is abundance of accompanying irrational movements.

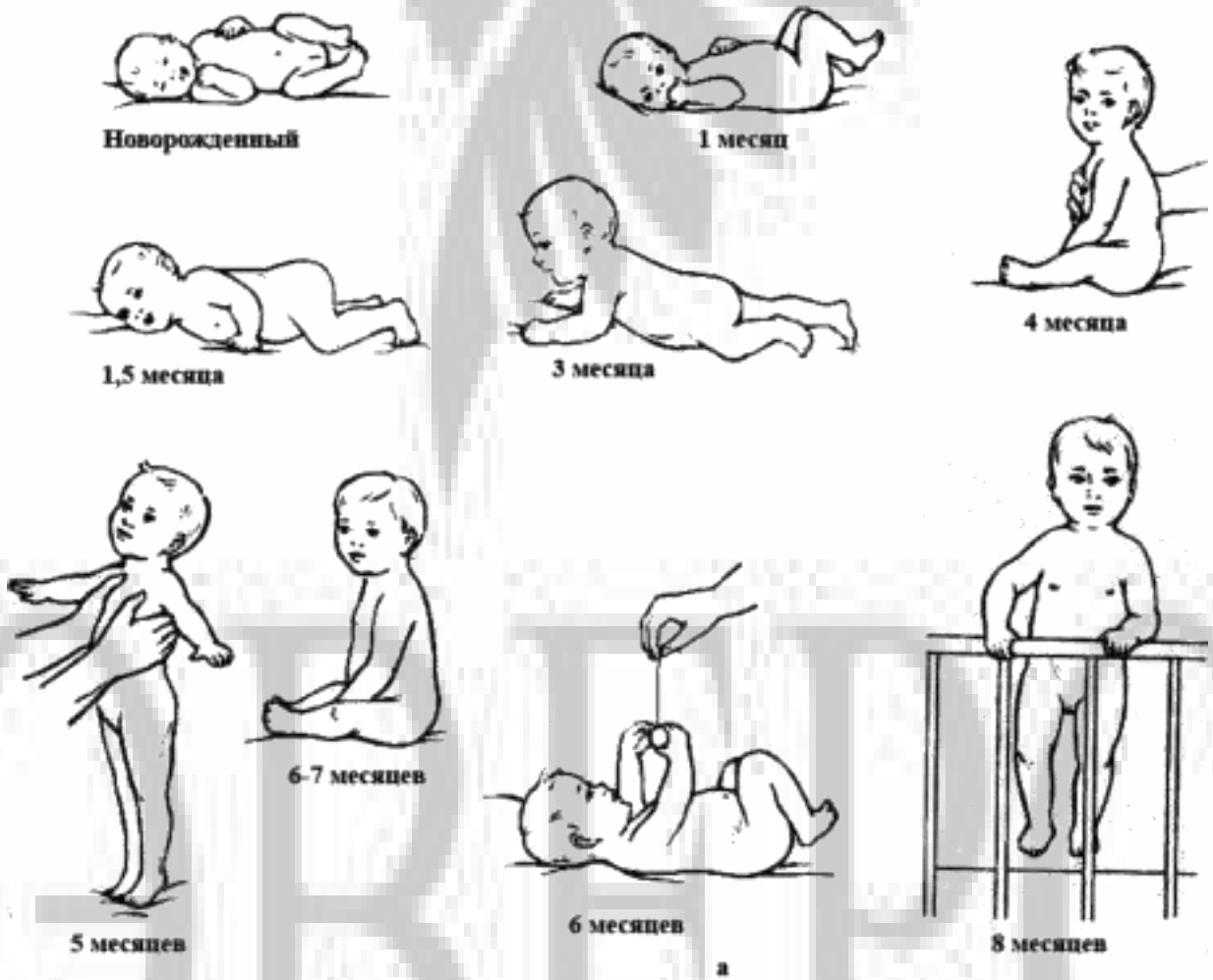


Fig. 15 The table of motoric and static movements of infants
a - in children of the first 8 months of life; b - for 9 - 12 months children; c - in children of 2 years of life.

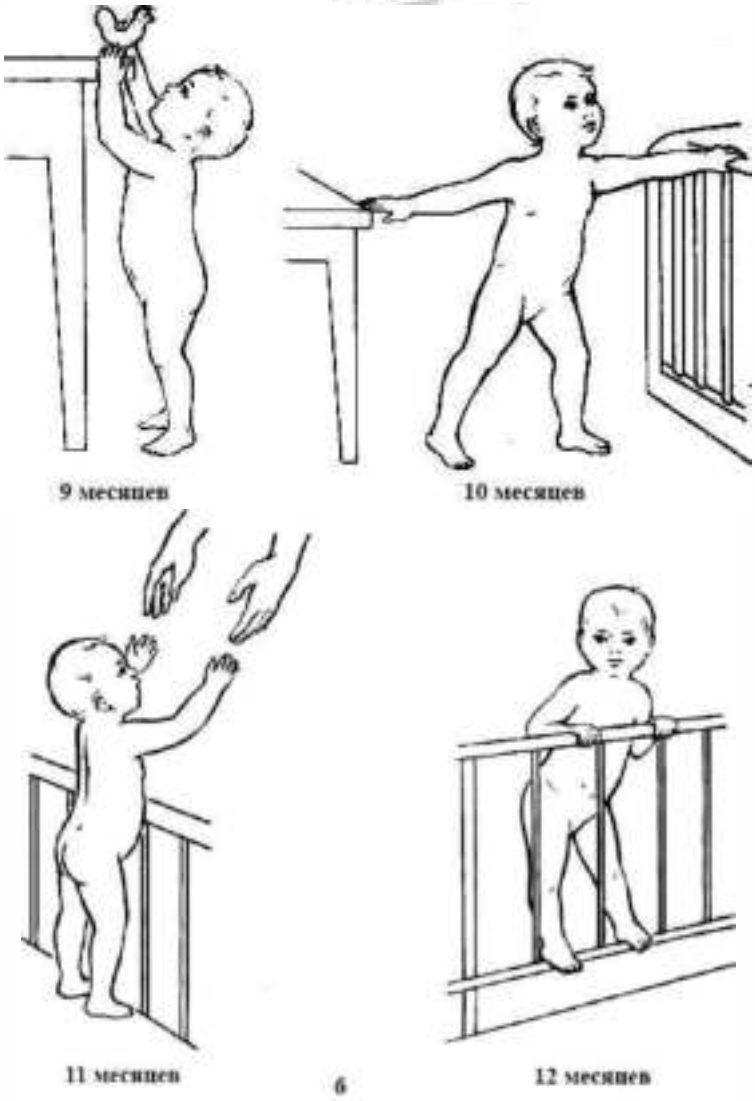


Fig. 15 (continuation)

Grasping movements of this period are accompanied by parallel movement of the second hand, in connection with which we can talk about a two-handed grasping. Finally, during grasping movements occur in the legs and torso and often mouth opening occurs. Grasping hand makes a lot of unnecessary movements of searching; gripe is exclusively performed with a palm i.e. the fingers are bent so as to squeeze toy in his hands. Subsequently, interaction between the motor and visual analyzers gets improved, leading to a more focused movement of grasping hands in7-8th month.

From 9 - 10 months there is a scissor grasping by clamping of thumb and II - III fingers along the entire length. From 12-13 months there is a grasping pincer with the terminal phalanges of the thumb and forefinger. During the whole period of childhood various friendly irrational movements gradually fade. On 4-5th month coordination of back muscles movements develop, which manifests itself initially by tumbling from the back to the abdomen, and then (in 5 – 6th month) - from the abdomen to the back. At the 6th month the baby starts to sit (himself) that already indicates the development of coordination of movements of the leg muscles.

Prone position with raised shoulders and head, eyes, aspiring forward - this is the optimal starting position for the development of crawling. If to this also a keen interest in the toy located very close is added, it is important to make sure there is one, and try to move it forward. It is also possible that in this case the child can grasp the object not only with his hand, but his mouth. In an unsuccessful attempt to seize the toy, stretching his arms forward, the child gradually begins to pull the trunk and again throws forward his hand. The absence of alternation in the throwing hand, chaotic first movements of legs often end with a tumbling sideways, or even crawling back.

More mature crawling with a cross movement of hands and feet is set by the 7 -8th month. Relatively quickly after it the child begins to lift the abdomen and then prefers traveling in space only by crawling on all fours.

The beginning of walking of the child is considered the standing at the crib or playpen with stepped feet along the headboard or barrier. This occurs in about 8 – 9th month. Later, the child crosses with the support of his two hands, then one hand, and, finally, making first steps around the first year. There are considerable variations timing of walking. Some children may walk in 10-11th months, the other ones - later (1 year 4 months.). Mature gait will be installed in a few years. One year old baby widely spreads his legs, feet directed to the side, legs bent at the hip and knee joints, the spine at the top is bent forward, in other parts is arched backwards. Hands initially are extended forward to reduce the distance, then for keeping balance or bent and pressed against the chest for insurance when falling. After 1 - 21/2, the legs are straightened, and the child goes, almost without bending them (walking on the elongated sticks), and only by 4 to 5 years, it is possible to see the correct mature gait marching with synchronized arm movements. Date of formation of motor skills in children and statics of the 1st year of life are given in the Table 7 and Figure 15.

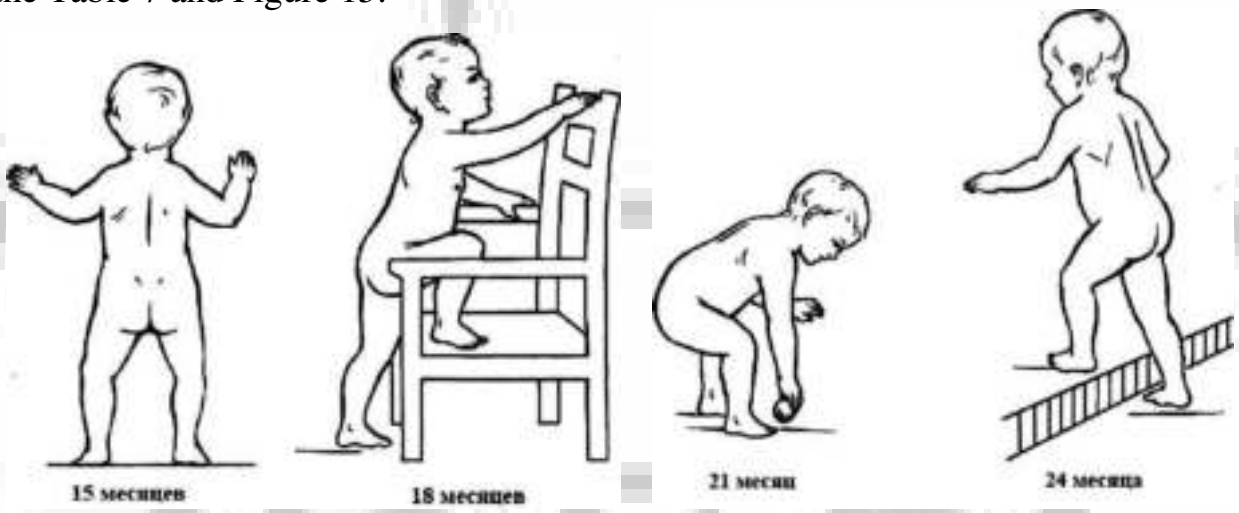


Fig. 15 (continuation)

Improving the movement continues for many years. The highest level of organization of movements inherent almost exclusively to a man was named by Bernstein as the level substantive action. This is purely a cortical level. According

to localization in the cerebral cortex it can be called as the parietal-premotor. Along with the development of the organization level of the child's movements can be traced by observing the improvement of finger movements from the first grasping fingers at the age of 10 to 11 months prior to the manipulation in adult ages, including writing, drawing, knitting, playing the violin and the other arts.

Improvement of motor activity is associated with the formation of the relevant regulatory units, and to a large extent depends on the repeatability of action, i.e. by motor education or training. Self-education of child movements is also a powerful stimulus for the development of the nervous regulation of movement. What depends on the child's level of mobility? For a newborn baby and the first weeks of life, movements are a natural component of the excitement. This is a reflection of negative mood and a signal of need for his desire to be satisfied by parents - to feed and water, change, improve wet or poorly put diapers, eliminate pain. Motor activity is largely influenced by the formation of sleep and wakefulness.

If the newborn's physical activity is relatively low, then the distribution of it throughout the day in connection with wakefulness and sleep is virtually uniform. Starting from 2 - 3rd month of life overall growth of physical activity takes place with the highest concentration in active waking hours. Some psychologists even think that there are some minimum daily activities and movements, if the child could not dial it while awake, his sleep will be restless. If to quantify the ratio of the mobility of the child in waking and going to sleep, then the first they will be equal up to 4 months 1:1, in the second 4 months of the first year it is already 1.7:1, and in the last months of the first year 3.3: 1. The total physical activity increases significantly. During the first year of life there are a few peaks of locomotor activity. They account for 3 – 4^{th}, 7 - 8^{th} and 11-12^{th} months of the first year of life. The occurrence of these peaks is due to the formation of the new features of sensory or motor areas. The first peak is the complex of revitalization and joy at the first dialogue with adults, the second peak is the formation of binocular vision and activation of crawling (the mastery of space), and the third one is the beginning of the walk. This principle of sensorimotor relationships maintains in the future as well.

Table 7 **Average time and possible limits of infants' motor acts in the first year of life.**

Movements	Average age of mastering	Possible limits
Smiling	5 weeks	3-8 weeks
Cooing	7	4-11
Holding the head	2 months	1.5-3 months
Targeted movements	4	2.5-5.5
Targeted movements of arms	5	3.5-6.5
Turning	6	5.5-8
Sitting	7	5-9
Crawling	8	5.75-10.25
Grasping	9	6-11
Standing	9.5	6.5-12.5
Walking with support	10.5	8-13
Standing independently	11.75	9-14
Walking independently		

5.3 The conditioned reflex activity, the development of emotions and forms of communication

Conditioned reflex activity in children for the first time began to be studied 75 years ago in our country by a disciple of Pavlov, a well-known Soviet pediatrician N.I.Krasnogorsky, who applied an objective method of research. Especially great merit in the study of conditioned reflexes in children under normal and pathological conditions is the works of A.G.Ivanov-Smolensky, N.I.Kozin, A.V.Abolenskaya and others. It was established that even the newborn's cerebral cortex is capable of forming conditioned reflexes. However, during the first 2 - 3 weeks of life the child has a very limited amount of conditioned reflexes.

The main factor in the formation of reflex is due to predominantly the food. If to take a crying child in the arms and press towards chest (position while breastfeeding), he calms down. Then there is a certain rhythm of activity at the time of feeding. In the beginning, conditioned reflexes are formed with difficulty. There is a small strength and mobility of the processes of excitation and inhibition, since they are not balanced and often widely irradiate; with age, concentration becomes possible. Differentiation of conditioned reflexes normally begins at the end of the 2nd and beginning of the 3rd month of life. Along with growth and development there develops a set of conditioned reflexes, which manifests itself in a variety of emotions of children when dealing with them. It should be noted that the characteristic feature of conventional bonds formed among children is their strength and the rate of formation. By the 6th month already the formation of conditioned reflexes from all the sensing organs (eyes, ears, nose, skin)is possible. During the 2nd year of the mechanism of formation of conditioned reflexes has already reached full development and operational excellence.

Emotions of a newborn is exclusively negative by nature, monotonous (cry), and always rational as it serves as a reliable signal of any trouble in both internal and external environment for the child. Mother, perfectly guiding in the current situation, in most cases, can satisfy the child returning the necessary comfort by feeding, change diapers, and so on.

However, already in the first days of life when an adult approaches the child increases motor activity and enhances sucking movements - response anticipation of feeding. On the 2 – 3th week of life in the process of feeding within 3 - 4 minutes, when there is a little pause for rest, the child carefully considers his mother's face and her hands, trying to palpate the breast or bottle. From the first month of life such interest to the mother emerges outside feeding situation during wakefulness active. In about 6 weeks the beginning of a smile is formed, the smile by the 8th week to a face of an approaching adult, usually the mother, becomes quite obvious; from 9 to 12 weeks smiling is accompanied with the laughter and general motor liveliness with throwing arms, shuffling feet, joyous yelps.

Approaching of a stranger to the child of 4 - 5 months initially calls the termination of movements and cooing, wide open eyes, often mouth opening. This is the orientation reaction, which should be followed by a joyful revival more often, or an opposite reaction may also come – reaction of fear and negativity. The older

the child is the more natural orientation reaction goes into fear and negativity. Simultaneously, in relation to the people with whom contact has developed, there is an additional emotional component - often violent negative reaction to withdrawal or other termination of communication.

At the age of about 5 months, the child learns his mother among other people, the emotional reaction to her appearance and disappearance from the area of vision of the child is clearly different. After 6 - 7 months active cognitive activity of the child is formed, he continually manipulates objects and toys. Therefore, the first negative reaction to a stranger is rather easily suppressed by natural curiosity for a new toy. At this time, cooing is significantly enriched and the touching communication arises, i.e. understanding the meaning of individual words, spoken by adults. This understanding is expressed clearly by turning the head, pulling the arms in the direction of called object or person.

After 9 months the child's emotional life is considerably enriched and expression of emotions is enhanced. Contact with a stranger is set much harder, reactions to different people is much differentiated. There is a timidity and shyness. In all cases, making contact is possible through the child's inherent curiosity, interest in new subjects and new manipulations. Touch communication is enriched in 9 months, so that it can be used to organize the child's actions. He can understand the ban, and other simple instructions. Real speech is formed, i.e. the motoric speech.

The speech development. Formation of speech is due to the emergence of function of sensory and functional maturation of the brain. The differentiation of the second and third frontal gyrus (Broca's area) is of particular importance, which determines the ability to articulate speech articulation, and superior temporal gyrus (Wernicke's area).

Table 8. **Voice reaction and sequence of speech development in healthy children**

Age	Voice response and development of speech
1.5 month	Cooing: a-aa, e-ee and so on.
2-3	g-u, sh-ee, bu-u, ae, etc.
4	Fistula: al-le-e-lee-aga-ae, etc.
7-8.5	Babbling: pronouncing syllables(ba-ba, ta-ta, etc.)
8.5-9.5	Modulated babbling-repeating syllables with different tones
9.5-18	Words: mama, papa, baba, dyadya, am-am (eat), etc. All nouns are used in singular form
18-20	Attempts of making a phrase (mama, give), mastering imperatives (give! Go!), since something is important for the child and he wants it.
22-24	Vocabulary reaches 300 words. Nouns-63%, verbs-23%, other parts of speech-14%. Without prepositions. From 18 to 24 months there is first phase of questions: what is this?
3 y.o.	There are grammatical forms that help the child to express relation with particular objects, space (case grammar),time (tenses). He masters case grammar gradually and finishes it quite late. The child uses more words, complex sentences, by the end of the year – prepositions and pronouns. Conditional sentences, long phrases.
5 y.o.	Monologues, terminal phase of speech development, the second phase of question types: "Why?"

The development of speech is also a product and result of child's communication with an adult, educational activity, adult skills and love for the child.

Understanding the development of voice and speech reactions is essential for the effective organization of educational work with the child (tab. 8).

The development of voice and speech reactions can be divided into several stages.

1 . The preparatory phase is the development of babbling and cooing. It begins at the 2 - 4 months. Cooing is short-term, is always is the reason of reactions of revival and joyful state. Cooing has not any signal values; however, it is an evidence of well-being and a positive emotional mood of the child. By the 5th month it changes into a long melodious cooing with a wide variety of sounds, sometimes difficult to play for an adult. At the age of about 7 months babbling appears, i.e. pronunciation during cooing by separate syllables.

2. The phase of sensory speech appearance. The sensory speech refers to the ability of the child to associate audible word with a specific image or object, i.e. having an understanding of the individual elements of adult's speech. This stage begins at the age of 7 - 8 months. The criterion for the start of the sensory speech can be searching visual response of the child to the question "where?". Most common are "where is my mother?", "Where is kitty?" may be the emergence of responsive action to a request to make "pat-a-cake", waving a hand, and so on. In parallel with the emergence of sensory speech the babbling develops intensively, it becomes richer, includes an element imitating the sounds heard by a child or self-imitation. Babbling is enriched intonations. By the year old age the child's vocabulary can reach several tens of understood the words. He knows the names of many activities, toys, the names of loved ones, performs several requests (give, show, open your mouth, and others.), He understands the words "need" and "cannot".

3. The phase of motoric speech occurrence. Typically, the first words are said by a child in 10 - 11th month. By the year most children pronounce 10-12 words. Girls master the motoric speech earlier and much more successful than boys. The first words are usually simple to pronounce monotonous syllables (ma-ma, pa-pa, dya-dya) or simplified onomatopoeia (ks-ks) or word-signs special traditional children's language (aw-aw, ah-ah). During the first half of the second year of life the vocabulary of motoric speech is enriched relatively small (30 - 40 words). This period is significant primarily an extension of the sensory capabilities of speech. By the 11/2 years the child already understands entire sentences, willingly considers the pictures with adult's comments. By the 2 year he is able to understand simple stories and fairy tales, carries out a large number of requests and instructions. In the second half of the second year, a jump of formation of motoric speech: improves articulation, vocabulary increases up to 200 - 300 spoken words. In a speech there are simple sentences, first built on the principle of simple contiguity of words (bebe bye), and by the end of the second year - sentences from 3 - 4 words elements with grammatical control. With this age judgments begin to form and it takes a leading

place among the means of communication of the child with other people. The terms of motoric speech development are different, that does not reflect the characteristics of children's intelligence. Girls usually master the motoric speech earlier than boys.

5.4 Role of imprinting and education in neuro-psychological development of a child

Imprinting is the mechanism of instant imprinting at which the first impression determines the nature of the response, affecting the entire life and activity of the body. For a long time its role in the psychological development of children has not been enough studied. However, observations show that it is of great importance in the formation of mental development and even future behavior, predetermining it for years to come.

What plays the most important role in the emergence of the love of a mother in the first year of life? It was found that in infants and children during the first months of life, the determining factor is the sense of comfort that occurs in a child when he touches the mother (or other adult caring for the child). This creates a sense of security. In addition, significant importance is the mother’s feeding her child, whereby creates a feeling of warmth. Mother teaches her child to understand gestures and voice signals, and speech. When a child begins to walk, the mother successfully regulates the first game, is developing the right relationships with peers. Communication with peers contributes to the development of partnership, social relations, and inhibition of aggression. It was found that the maternal care of her child is an important link in the right social behavior and youth.

A role in the neuro-psychological development of the child plays a father. He is particularly attentive to their children when they begin to walk and play.

Practice shows that the behavior and character of a child of school age is largely determined by the attention of the people who cared for him in his early childhood. Children who were educated by parents tend to be more adapted to school life. If the child brought up by a grandparent, they adapt worse to school than the other children, because usually while such up-bringing "rejection" is reduced, and, therefore, there is less stimulation to the cognition of the world. These children have significantly less developed coordinated movements. Children who are brought up in children's institutions (nurseries, kindergartens) are characterized by the earlier formation and improvement of motoric skills while at the same time they have less developed language skills and creative thinking.

Famous educator Ushinsky rightly says: "In the family seriousness should reign which allows admitting a joke, but do not turn the whole affair as a joke; tenderness without affection, kindness without weakness, order without pedantry, and most importantly - constant reasonable activity".

Children experiencing unfavorable conditions feel a kind of "mental starvation". According to P.S. Medovikov, this is "lack of mental allowance", and according to N.M.Schelovanov - "education deficitis".

The child needs constant contact with adults - teachers, parents, brothers, sisters. Gaspar Gauzer who was kept in the cellar up to 16 years by kidnappers and who had never seen a man leaving on freedom, could not walk and instead of speech barely uttered a few unintelligible words that he didn't understand himself. Similar behavior is described in children who, for whatever reason, were brought up in the lair of animals. This was described in many books and articles.

Depending on the environmental conditions and upbringing of the child may be delayed normal development of higher nervous activity. This development is also affected by child diseases, often significantly delaying it. That's why every child's doctor should be skillful, help to parents with competent advice to raise a child properly.

5.5 Sleep

A child's sleep is a natural component of his physiological activity, ensuring the normal rhythm of the processes of higher nervous activity, metabolism, physical development, growth and maturation. As a result of certain prior period of wakefulness, sleep becomes a guarantee or condition for the normal life of a child in the subsequent wakefulness. Inadequately organized wakefulness or the child's illness may lead to a breach of the usefulness and effectiveness of sleep and sleep disorders are the cause of the child's lack of activity during wakefulness. All of these factors can cause a delay of mental and physical development of children, and prolonged preservation give rise to diseases. Therefore, control over the organization of sleep of a child, the features of falling asleep, nighttime sleep and waking up is an important part of the overall observation of pediatrician and sleep disturbances may be the basis for an in-depth examination of children.

A newborn has polyphasic sleep character. So, during the day a newborn baby sleeps from 4 to 11 times, and real differences between day and night on the sleep duration have not been established yet. Over the years, there is a transition to polyphasic sleep to monophasic retaining only hidden items of polyphasic in older children and adults.

A clear predominance of nocturnal sleep occurs at the end of the first month and then it gets stabilized. In general, natural need for sleep decreases with age (Table. 9).

Table 9. **The natural necessity for sleep in children of different ages**

Age	Duration of sleep in hours	% of the day	Age	Duration of sleep in hours	% of the day
0-2 months	19	79	4-5 y.o.	11.5	48
3-5 months	17	71	6-9 y.o.	10	42
6-8 months	15	63	10-12 y.o.	9.5	40
9-12 months	13	54	13-15 y.o.	9	37
2-3 y.o.	12.5	52			

Table 10**. Indicators of neuro-psychological development of a child in the first year of life**

Indicant	Age in months					
	1	2	3	4	5	6
Visual-orienting reactions	Shortly focuses eyes on a bright item and observes it	Follows with eyes the toy moving in front	Focuses eyes on unmoving objects being in any position	Recognizes the mother	Recognizes close people from strangers	
Acusticus-orienting reactions	Shudders when hearing sharp noises	Listens carefully	Clear hearing concentration	Turns head to the source of sound	Differentiates tones towards himself	
Emotions	The first smile	Smiles back to the adult's speech	Responds back with a happy smile, liveliness of legs and sounds (complex of liveliness)	Laughs loudly		
General movements	Attempts of holding the head in prone position	Properly holds the head within 1-2 minutes in a vertical position	Properly holds the head in prone position. Presses with his feet	Turns from back to prone position	Stands without bending knees when supporting under armpits. Turns from back to prone position	Turns from prone position to his back. Crawls towards the toy
Arm movements and interaction with objects			Randomly pulls towards the toy hanging above his chest	Grabs the hanging toy	Confidently grabs the toy an adult holding over his chest	Freely grabs toys in any position
Pre-speech phases of speech development. Understanding speech			Starts cooing	Keeps cooing a little longer	Keeps cooing for a longer time	Pronounces syllables ma, ba (beginning of babbling)
Skills and abilities in processes						Grabs food with lips from the spoon when eating

Indicant	Age in months					
	7	8	9	10	11	12
Visual-orienting reactions Acusticus-orienting reactions Emotions						
General movements	Crawls well	Sits himself, sits. Stands himself and walks holding the supports	Walks when holding his both hands	Climbs on a not high surface and gets down from it	Stands without support	Walks
Arm movements and interaction with objects	Knocks two toys on each other, grabs a toy changing hands	Deals with toys a prolonged period	Makes different actions with toys depending on their properties	Opens and closes a box, puts one nesting doll into another	Puts cubes one on another, puts on the rings on a pyramid and takes them off.	
Pre-speech development	Repeatedly pronounces syllables	Loudly and repeatedly pronounces different syllables	Imitates hearing syllables he pronounces himself	Imitates syllables spoken by adults	Pronounces first meaningful words like mama, am-am, kitty	Pronounces 8-10 words
Understanding speech	As a response for question Where?-finds objects	By request of adults does pat-a-cake, bye-bye	Knows his own name. can find a requested toy out of many	Knows names of body parts, gives an asked by an adult object	Implements easy requests	Implements easy requests (understood vocabulary gets enriched)
Skills and abilities in processes	Drinks from a cup, held by an adult	Independently holds a loaf of bread	Drinks from a cup, slightly holding it	Drinks from a cup	Drinks from a cup	Independently grabs a cup and drinks from a cup

Table 11. **Indicators of neuro-psychological development of children in the 2nd year of life**

Indicant	Age in months			
	1 year 3 months	1 year 6 months	1 year 9 months	2 years old
Sensory development	While playing, can differentiate two things of different sizes	Picks up an object described by words and requested shape out of many objects	While playing, can differentiate three things of different sizes	According to requested quality of an object, finds an object of appropriate color
Movements	Walks long distances changing positions (bends, bows)	Steps over obstacles	Can walk on the surface of 15-20 cm width and 15-20 cm higher than the floor	Overcomes obstacles changing steps
Play and interaction with toys	Can apply skills acquired in action (feeding dolls, making a pyramid)	Can play actions observed in everyday life (brushing doll's hair, wash it up)	Constructs fences, houses	While playing implements logical actions like after washing the doll, dries it.
Active speech	Uses simplified version of babbling (car-bi-bi, dog- aw-aw).	In surprise, curiosity or excitement calls the name of an object	Makes two-word sentences	Uses two or three-word sentences when communicating with adults
Understanding speech	Significant increase of understood vocabulary	Out of objects of similar shapes, sizes, colors and purpose of usage, finds a requested object	Replies to the questions of an adult when observing a scene picture	Understands a short story of familiar to him events
Skills	Independently eats thick meals with a spoon	Independently eats liquid meals with a spoon	Can partially undress with little help	Can partially get dressed with little help

Table 12. **Indicators of neuro-psychological development of children in the 3rd year of life**

Indicant	Age	
	2 years 6 months	3 years old
Sensory development	Picks up according to a sample different objects of four different colors (red, blue, green, yellow)	Calls four main colors
Play and interactions with objects	Applies logical and related actions (feeds a doll, puts it her bed and so on.)	Roleplays (for example, I am a mother, I am a doctor)
Active speech	Makes sentences with more than 3 words	Uses more complex sentences
Skills	Gets dressed on his own, but can't button up or tie shoelaces	Gets dressed on his own, with little help can button up, ties shoolaces.

Reducing total daily sleep duration in children occurs primarily through the reduction of daytime sleep. By the end of the first year of life, the child goes to bed during the day 1-2 times. In 11/2 years, the duration of daytime sleep is about 21/2 hours and another hour is spent on sleep. After 4 years it is difficult to keep naps of many children. It significantly affects individual differences in sleep needs. However, it is desirable that all children up to 5 - 6 years of age have naps. Calm sleep of normal duration, short periods of transition from wakefulness to sleep and vice versa (no more than 30 minutes) are evidence of the safety of the child's health, the normal mode of life and good psychological climate in the family.

At all stages of age-related sleep duration is cycle organized, i.e. successive stages of non-REM sleep completed with REM sleep phase. During the night there are several complete cycles. The duration of the individual cycles varies considerably with age. In the early years of a child's life REM sleep occupies about 50% of total sleep time, in 3 - 5 years it is about 30% and after 5 years is 22-28%.

Changes in the structure and duration of deep sleep can be stated for such a characterization, as the amount of movements during sleep. The child of first years of life has greater sleep than that of older children (80 versus 60), but abundance of movements during sleep does not interfere with sleeping of infants and often leads to the awakening of the older child.

Phase of REM sleep is characterized by physiological myoclonus, small rapid twitching of individual muscle bundles and groups with little movement in small joints such as twitching fingers and facial muscles. At the stage of slow wave sleep myoclonus is much smaller.

In the infancy the sleep problems are relatively rare, during normal active wakefulness the child gets tired and falls asleep rather quickly. At the age of 11/2 years falling asleep occurs with difficulty, and it is important to help the child to find the techniques that contribute to sleep. Here great importance is of the preservation of a familiar environment, and the child’s stereotyped behavior at bedtime and of others as well.

Indicators of neuro-psychological development of children during the first three years of life are given in the tables 10-12.

6. THE SENSORY ORGANS

6.1 Sense of vision

Aniage of eyes occurs on the 3rd week of fetal development, when retinal cells detach from the cranial part of the neural tube. However, by the time of birth the development of the eye and the visual analyzer is far from complete. For the final formation of the organ the stimulation of visual stimuli is necessary.

Newborn's eyes seem larger. The ratio of the eye mass to body weight in newborn is 31/2 times higher than in the adult. Increasing the size and mass of the eyeballs is particularly intense in the first 3 - 5 years of life, and then it slows down; growth takes place in the end of puberty. With age the diameter of the cornea increases, the diameter of iridial part of retina (from 3.3 to 12 mm) and its thickness (0.17 to 0.5 mm) increase. Especially eye lens weight rapidly increases. It is 66 mg in the newborn, 124 mg at one year old child, and 170 mg in an adult.

With the growth of eyes and the change of eye muscle function are associated the refraction changes. Farsightedness (hyperopia) is characteristic in the first hours and days of life of children, which can reach the value up to 7.0 diopters. Over the years, the degree of hyperopia is reduced, and the majority of children aged 9 to 12 years old have almost emmetropic eyes.

For the newborn is characterized by moderate photophobia, his eyes almost constantly closed, pupils are contracted. A well-defined corneal reflexes is determined and ability to convergence is uncertain. Nystagmus is noticeable. Visual power is about 20/300. The lacrimal glands are not functioning.

At nearly two weeks of age transient fixation of sight may occur, usually monocular. The pupil begins to expand moderately, the secretion of lacrimal glands begins as well. However, part of the lacrimal apparatus in the emotional reaction is usually detected much later (about 12 weeks).

In the 3rd week the child resistant binocular focuses eyes on a stationary object and watches a short time moving. In 6 months visual acuity improves to 20/200, there is a reaction to the perception of bright red and yellow colors, stable coordinated movements of the eyes and hands. At the age of about 6 months the child sees well not only large but also small items. In the interval between the 6th and 9th months of life the ability the stereoscopic perception of space is set, there is an idea of the depth and distance of objects location. By the year visual acuity is up to 20/100, the transverse diameter of the cornea is 12 mm, i.e. the value of it is almost as an adult's eyes. The range of adaptive responses of the pupil expands significantly; the perception of geometric forms arises.

The issue of perception of color differentiation in young children has not been settled, but since 11/2 - 2 years old the child can pick up 2 - 3 pieces of similar colors, after 3 years, all the children have developed color vision.

At about 4 years old maximum visual acuity (20/20) is achieved; at that time the child is ready for the initial reading. Subsequently, perception of colors and distances gets improved.

Visual function in the newborn can be verified by bringing the light source to his eyes. If the child is awake, he closed his eyes and will seek to turn the face to the light. In bright and sudden light the child's eyelids are closed and he throws back his head (Paper reflex). If a child sleeps, when approaching light to his eyes the forcing clamping of eyelids happen. Starting from the 2nd month the child follows a bright toy which he sees, moving near his face. In older children the function of the visual analyzer (visual acuity, volume of view field, color perception) is studied using a set of special tables.

6.2 Hearing

Newborn's ear is morphologically enough developed. The external auditory meatus is very short due to its underdevelopment of the bone. Eardrum dimensions almost the same as those in the adult, but it is located in a horizontal plane. The Eustachian tube is short and wide. The middle ear contains the embryonic connective tissue which resorbs before the end of the first month of life. The cavity of the tympanic membrane is airless before the birth, it is filled with air at the first breath and swallowing movements.

It was found that newborn can hear; it is also proved that the larger sounds are able to be perceived by the fetus in the last weeks of pregnancy. It is obvious that a bone conducting sound waves play a specific role. The reactions of the newborn and premature baby to the sound can be expressed in the general motoric reactions, crying, changing the frequency and rhythm of heartbeats, respiration, ECG and EEG. Subsequently, sensitivity of auditory perception and the ability to differentiate sounds at the volume, frequency and timbre improves.

For example, a newborn differentiates the power of sound, only about 12dB, subsequently differentiates the volume in tenths of a decibel. The 31 / 2 month old child differentiates sounds from each other by 17 tones, and by the 7^{th} month - 0.5 tones.

The function of the auditory analyzer of a newborn is checked on response to a loud voice, a clap or noise rattles. The child who is able to hear closes his eyelids and seeks to turn his head toward the sound. Sometimes the reaction is manifested in generalized restlessness: newborn baby pulls arms, opens his mouth makes sucking movements, and appears weeping grimace on his face. Starting from the 7 – 8^{th} weeks the baby turns his head toward the sound stimulus. The child of a few months can be checked the following way: drop the toy in front of him so that he could not see where it fell over. A healthy child, following the collapse of toys, at the time of fall on the floor will pull in that direction. If a child cannot hear, he does not react to the sound of falling toys. Auditory function of older children is explored on the perception of whisper, loud speech, and the sound of a tuning fork. Perception of individual frequencies of the sound spectrum is studied using audiometry.

6.3 The sense of smell

The peripheral portion of the olfactory analyzer is developed in the period from II to VII month of fetal development. The receptor cells are located in the mucosa of the nasal septum and the upper turbinate. It is believed that the sensitivity of the olfactory receptors in utero is the highest and regresses to some extent even before birth. Neural mechanisms of differentiation of olfactory sensations begin to function sufficiently in the period of the 2nd and 4th months of life, when the child's different reactions are clearly visible on pleasant or unpleasant odors. Differentiation of complex odors improves up to primary school age. This is due to the increasing corticalization of olfactory analyzer and despite the progressive reduction of the sensitivity of peripheral receptors.

The study methodology. If to bring an odorous substance to newborn's nose without irritating the mucous membrane, such as valerian drops longer-term smelling, then the child will react with facial expressions of displeasure, shouting or sneezing, and sometimes general motoric restlessness. The child of older age can be brought solutions of the same colored - scented and unscented, asking at the same time if it "smells or not?"

6.4 Taste

Taste buds are formed in the last months of fetal development. It was found that the fetus and preterm child distinguish well between sweetened water or milk, and react negatively to bitter or salty and sour. Taste receptors of newborns occupy significantly larger area than in adults; in particular, they occupy almost the whole tongue, lips, hard palate and buccal surfaces of the oral cavity. Threshold mouthfeel of newborns is higher than that of adults. The reaction to the sweet is always expressed in a calming and sucking movements, and all the other taste sensations with negative reaction like wrinkling, general anxiety, and sometimes vomiting. The ability to distinguish not only the basic taste, but also the gradation of concentrations and ratios between the different components of flavor develops gradually and completes at primary school age.

Taste is studied when applying of sweet, bitter, sour and salty solutions to the tongue. An older child should call the taste of the coating solution. Newborns reacts sucking and smacking on the sweet solution, to bitter, salty and sour - lip protrusion, salivation, facial wrinkling, sometimes restlessness, cry, cough, vomiting.

6.5 Skin sensitivity

Morphological formations, providing skin sensitivity, are very diverse. Tactile stimulation is perceived by free nerve endings of the skin, or by special cells. It is assumed that the free nerve endings of pain perceive mainly traumatic stimulation, while encapsulated receptor-clots are specialized for stimuli.

Pain sensitivity receptors appear at the end of III month of fetal development and newborns immediately detect sensitivity to pain, but the pain threshold on them is significantly higher than in older children and adults. The sensitivity to pain in preterm infants is particularly low. Reduction of pain sensitivity is especially noticeable when carrying out a study with an electric current. Reduced pain sensitivity is observed in full-term baby for a few days and gradually disappears, however, decreased sensitivity to stimulation of electrical current may persist until puberty. At the beginning the reactions of the child to painful stimuli are generally characterized, and only a few months later there are more suitable local reactions.

Tactile sensitivity of the skin occurs very early (already in 5 – 6th week of fetal development), and at first it is localized exclusively in the perioral area, and then in the 11-12th week quickly extends to the entire skin surface of the fetus and it becomes reflexogenic zone. Irritation of skin receptors is related to the detection of the vast majority of so-called vestigial reflexes, detected in the fetus and newborn. It is possible that such high sensitivity of fetal skin is associated with other receptors than in the postnatal period, because the lamellar bodies (Pacini clots) and tactile cells (Meriel) are formed only in VI - VIII month of fetal life, and the nerve plexus around the hair follicles and tactile corpuscles (Meissner corpuscles) complete development at about a year of life. Thus, the tactile sensitivity of the fetus and newborn is significantly ahead on the terms of its appearance than all other senses.

Thermal reception is allegedly carried out by Ruffini corpuscles (heat) and Krause cones (cold), and is presented in the newborn in morphologically and functionally completed form. Cooling receptors are almost 10 times more than the heat ones. The receptors of these groups are scattered very unevenly. The child's cooling sensitivity is considerably higher than the overheating.

Tactile sensitivity. Presence of tactile, or haptic, touch sensitivity is tested on the skin of the child with a piece of cotton or a brush. The most sensitive areas are the fingertips, red border of the lips, genitals. In this kind study on sensitivity of older children they are asked to close their eyes and count the number of touches with the word "yes." The tactile sensitivity of the newborn is judged by the appearance of the unconditioned reflex: to touch on the eyelashes and eyelids the child closes his eyes, touching lips or tongue will cause a sucking motion, when cheek skin irritation the child turns his head towards the stimulus, stroking the sole causes dorsiflexion of the toes, touching the palms causes grasping reflex. The child of 2 - 3 months pulls his arms to the place of stimulation. At the age of 3 - 6 months it is possible to conclude on the presence of tactile sensitivity by observing how a child feels his hands, feet, the mother's breast. In the second half of the child's life tickling of feet, neck, armpits cause reciprocal emotional reactions (crying, laughing).

Temperature sensitivity is determined by applying test tubes with cold and warm water to the skin. Newborns respond on thermal stimulation with restlessness and crying. A child of older age replies as "warm" or "cold."

Pain sensitivity. The child is asked to close his eyes and is causes a few needle sticks, alternating them with touches of the blunt end of the needle. While presence of pain sensitivity a child distinguishes between irritations, answering "acute" or "blunt." A small child reacts to an injection with anxiety and cry.

7. SKIN AND SUBCUTANEOUS TISSUE

7.1 Skin

Skin is composed of two main layers: the epidermis and dermis. In the earliest stages of fetal development epidermis contains a number of polygonal cells, and gets a two-layer structure between the 5th and 7th weeks. The inner layer is called the basal, or germinal layer, from which spinous cells, granular, vitreous, the horny layers and executed a multilayered epidermis of the skin are formed by the gradual differentiation.

The skin is an indicator of the age of fetal development. Thus, the skin on the planta sulci appears on week 32 -34, in the upper part of the sole are transversely. In about 37th week sulci occupy about 2/3 of the area of the foot, especially in the upper sections. By week 40 the whole planta is striated with sulci. Prenatal hairs (lanugo) cover the whole body of the fetus approximately by 20th week of fetal development. From about 33rd week they gradually begin to disappear from the face first, then the trunk and extremities. By week 40 prenatal hair remains only in the region of the blades, and by week 42 disappear completely.

Nipples and areola of breast glands begin to protrude from the skin to the 34th week and from 36th week nodules of glandular tissue can be felt (1-2 mm), the dimensions of which are increasing rapidly (in weeks 37 – 38 they are 4 mm, at 40th week - 7-10 mm). The glandular tissue is accessible to palpation up to 3 weeks of life.

The thickness of the epidermis in infants and young children in different areas of the body ranges from 0.15 to 0.25 mm, while in the adult from 0.25 to 0.36 mm. Of all the layers of the children epidermis most special are basal, granular and stratum corneum.

The basal layer of neonatal is well-expressed and represented by two cell types: basal and melanocytes. Due to the lack of melanin in the skin of the newborn the skin color might be lighter in the beginning; in African newborns it has a reddish color.

The granular layer in children is weak, which explains the considerable transparency of the skin of newborns and young infants, as well as its pink color. In newborns and infants through the transparent horny layer and barely noticeable prickly layer the color of blood in the capillaries can be seen. In the cells of the granular layer in newborns there is no keratohyalin - the substance, which gives white color to skin.

Stratum corneum in neonates is thin in contrast to those of adults, consisting of 2 - 3 rows of dead cells, but the structure of epidermal cells in children is looser and contains more water, which creates the impression of greater thickness.

The boundary between the epidermis and dermis is uneven, sinuous. Due to the weak development of the basement membrane separating them in diseases of the epidermis is easily separated from the dermis, which explains the possible occurrence of epidermolysis - slight blistering in pressure areas on the mucous membranes, as well as in infections (streptoderma and staphyloderma).

The surface of the newborn skin is covered with secret with ρH, close to neutral, - 6.3 - 5.8. However, during the first month of life ρH value is significantly reduced and reaches 3.8. This is accompanied by a significant increase in skin bactericidal.

There are significant differences in the structure of the dermis in children, which has a predominantly cellular structure (in adults it is fibrous structure with a small number of cellular elements). Only by 6 years old histological structure of the dermis get close to that in adults, although collagen fibers are more subtle and elastic fibers are poorly developed. They increase by 6 years and reach maximum at about 35 years.

Skin appendages develop from primary epithelial germ cells. Nails appear on the 5^{th} week of fetal development and are modified epidermis - without granular and glassy layers. The anlages of which form hair and sebaceous glands emerge in the 5 - 7^{th} week of fetal development and are the product of the differentiation of the basal cell layer of the epidermis. Sweat glands appear on the 8^{th} week, especially on the palms and feet.

The hair in the form of embryonic gun falls out shortly after birth and is replaced by permanent ones.

Hair on the head of a newborn of different lengths and colors do not define further splendor of hair.

A special feature is the slow growth of hair in the first 2 years of life (0.2 mm each day, compared with 0.3 - 0.5 mm in older children) and their quick change. Eyelashes grow rapidly in children and at the age 3 - 5 years they are the same length as adults' eyelashes. (Beauty and expressiveness of the faces of the children at this age is due to this fact.) The thickness of the hair on the head increases substantially with age. Thus, the cross section of the newborn hair is 0.06 mm, the end of the first year it reaches 0.08 mm in preschool - 0.2 mm in an adult - 0.35 mm. During puberty facial hair (boys) appears, as well as in the armpits and pubic.

Nails of full-term infants reach the distal end of the last phalanx and are one (less constant) of the criteria of maturity. In the first days of life there comes a time delay of nail growth, which is manifested in the appearance of the nail plate transverse "physiological" lines. At the 3rd month it reaches the free edge of the nail. This makes it possible to determine the age of an infant. The same slowdown in nail growth is seen in children after severe diseases: the nail bed strip appears after 4 - 5 weeks from the onset of the disease, and at the edge of the nail - in 4-5 months, i.e. by its appearance can be judged the term of suffering from the disease. During protein-calorie malnutrition may appear two-sided spoon-shaped nail deformation - celonychia.

The sebaceous glands are spread throughout the skin except for the palms and soles. They are fully documented morphologically and begin functioning already in VII month of fetal life and histologically are not different from that of adults. The sebaceous gland in newborns can regenerate into the cyst, especially on the nose and on the skin of the adjacent areas of the face, forming small white and yellow formations (milia). They may be superficial and disappear with generic or grease

may be placed under the horny layer of the skin. On the scalp due to their increased secretion may be formed "lactic cortex".

Number of sudoriferous glands of a child by birth is the same as in the adult. Therefore, as the square of body surface grows the sweat glands per unit area progressively decreases. Thus, in the first days of life amount of eccrine sweat glands per 1 cm 2 body surface area of more than 1000 by the end of the first year - 550 - 500, and to 15 years - 200, an adult - 150. At the same time the formation of morphological eccrine sweat glands by the time of birth is not completed. Hypoplasia is excretory ducts of sweat glands, what has caused the imperfection of sweating. Formation of the excretory ducts of sweat glands is partially observed already in the 5th month of life, and completely ends only after 7 years. The formation of sweat glands on the forehead and head is completed. This is often a sweating, anxiety accompanied with the child's and alopecia (rubdown) neck. Later, there is perspiration on the skin of the chest and back. The rate of formation of sweating function is highest in the first and second months of life. Calculations show that the two-week child per 1 kg of body weight per day of the skin evaporates 25 g of water, at the age of 1 month - 30 - 36 g, and by the end of the 1st year of life - 40 -50 g. As the maturation of sweat structure glands and the autonomic nervous system change, then sweating threshold varies as well. So a two weeks old child starts to sweat when the air temperature is 35° C, and the child of 21/2 months - at 27 - 28° C. Adequacy of sweating, i.e. its compliance with the direction of change of temperature, develops during the first 7 years of life. Young children often respond sweating to reduce the ambient temperature and, as a rule, unable to inhibit sweating at lower temperatures. Apocrine sweat glands in young children do not function at all. The beginning of their functioning refers to only about 8 to 10 years.

At the time of birth the child's skin is covered with a fairly thick layer of cheesy grease (vernix caseosa). Sometimes it is very rich, which is apparently connected with the constitutional features of the child. Cheesy lubricant consists of fat, cholesterol and there is much glycogen. It also contains the exfoliate epidermis (a breeding ground for micro-organisms). Excess of it is to be removed. After removing the grease and cleaning the skin from accidental contamination during the passage through the birth canal some parts of newborn skin swells and becomes pale.

Initial pallor is then replaced with a more reactive redness cyanotic shade - physiological skin catarrh of newborns (erithema neonatorum); in preterm infants physiological skin catarrh is expressed especially sharply. Reds reaches its maximum within 1-2 days of life, and then is replaced by small peeling of the epidermis, which usually coincides with the appearance of a jaundice of the skin and sclera (neonatal jaundice - icterus neonatorum) in 80% of children. The jaundiced skin coloring reaches its greatest intensity at the second or the third day of life and usually to 7 - 10th day it disappears. Sometimes yellowness covers continues up to 3 - 4 weeks, which is relatively often in premature infants. Prolonged jaundice in full-term baby is always a doubt in his physiological and

requires further study. It can be a manifestation of the immunological conflict with at Rh- incompatibility of mother and fetus blood or ABO system, a manifestation of hypothyroidism, congenital hepatitis, hemolytic anemia, sepsis and, biliary atresia.

The development of neonatal jaundice is associated with an increased destruction of red blood cells and immature enzyme systems of hepatic glucuronyl transferase deficiency that turns free bilirubin into the blood soluble bilirubin.

The physiological role of the skin is great. The skin is a protective organ due to its durability and ability to withstand tension, pressure, compression. In children, this feature is much less pronounced. This is evidenced by the lighter skin vulnerability, frequent becoming infected, due to the lack of keratinization of the stratum corneum, as well as the immaturity of local immunity. The surface of the baby's skin is drier than in adults and has a more pronounced tendency to flaking due to physiological and parakeratosis and weaker functioning of the glandular apparatus of the skin.

These indicated features make baby skin vulnerable and prone to inflammation; they also form the basis of the most common disease of the skin changes at this age (erythema, diaper rash, cradle cap, and so on). Children's skin propensity to maceration, getting easily infected, richness with water, enriched blood supply determines the peculiar manifestations of skin symptoms such as rash of juicy character during childhood infectious diseases.

Skin is a breathing organ. The intensity of the cutaneous respiration in children is very high. According to V. Molchanov, this function of the skin of a newborn is expressed 8 times stronger than in an adult. The excretory function of the skin in young children is not perfectly functioning. Sweat glands are functionally underdeveloped. Body temperature regulation by the skin (about 80% of those-sweating) deficient in infants and children during the first months of life, it is associated with greater body surface, a well-developed network of blood vessels, due to which children are prone to overheating and cooling. Immediate evaporation is more pronounced in children.

Resorptive function of the skin in children is high (the fineness of the stratum corneum, the abundance of blood vessels). This is the basis of contraindication to the use of certain substances in ointments, creams, pastes. Use of ointments is harmful, which are made of substances that have a toxic effect, for example, yellow mercury ointment, the accumulation of which can cause liver, kidney, cardiovascular failure.

The skin is a complex sensory organ. It incorporates numerous and diverse receptors perceiving stimuli coming from the outside, so the skin plays a crucial role in the process of neonatal adaptation to environmental conditions. Almost all newborn reflexes are caused by touching his skin. Most sensitive to touching are the skin of hands, soles, face.

The skin is the site of the formation of enzymes, vitamins, biologically active substances.

7.2. Method of studying skin

Most of functions of the skin and its closest physiological connection with different organs and systems makes it as a peculiar screen, which reflecting many of the pathological processes in the body. Therefore, the correct assessment of the skin condition has a great practical importance in diagnosis. Research technique of the skin integument includes collection of anamnesis, examination, palpation.

Anamnesis. In case of pathological skin changes (discoloration, rash, integrity disturbance, scarring, peeling, etc.) we should figure out that: when it was appeared changes like these or other one; how quickly it was appeared discoloration of the skin; where it was appeared the first elements of rashes, what they look like, whether single or multiple: what is the speed of propagation of the rash, its localization, symmetry; how the rash changed over time (change color, shape, size of items, the appearance of peeling); is it happened skin changes of temperature reaction; was the child in contact with infectious patients; were there previously similar rashes; what relatives can associate the discovered pathological symptoms (eating, drug, recent disease). In the future, after conducting an objective examination it should return to a more focused questioning.

Examination. Examination of the child must be made in a warm bright room. The best results are obtained by inspection in transmitted light side. Young children undress entirely; the older children with a sense of modesty, you need to undress gradually, in the course of the inspection. It is necessary to remember that a small child is easily cooled, so it cannot be long kept undressed. Examination is conducted usually from the top to down. Special attention should be paid to the examination of the skin folds behind the ears, on the neck, in the armpits, groin area, hips, under and between the buttocks, interdigital period. At the same time the folds unwrapped or slightly stretched. The skin of the pilar part of the head, hands, soles, and anus are not less carefully inspected.

Skin color depends on the amount of skin pigment (melanin), thickness of a cornual layer, degree of blood supply, condition of the small vessels of the skin, on the blood (red blood cells and hemoglobin), degree of irradiation with ultraviolet rays. The color of the skin of a healthy child is a smooth pale pink or brown. Under the influence of pathological and some physiological conditions the color of the skin may change. The most frequently observed skin pallor due to anemia, edema, vasospasm (cooling, fear, vomiting), as well as insufficient filling of blood in the vasculature, for example, in case of insufficiency of the aortic valves. Practically, it is important to distinguish pallor, which is connected with the change in the qualitative or quantitative composition of blood, by the pallor that driven to spasm of the vessels so-called pseudoanemia. The main difference between anemia of pseudoanemia is the color of the mucous membranes: in a true anemia mucous membranes it become pale, if pseudoanemia it remains pink. In some diseases, pallor turns out characteristic color: - hemolytic anemia - icteric, in a hypo - and aplastic anemia - waxy, optical endocarditis – in a color of coffee with milk, in a purulent-septic diseases and toxicoses - earthy grey, in a chlorosis - greenish.

Redness of the skin (hyperemia) as a physiological phenomenon may occur under the influence of high and low temperatures, in a mental stimulation and in a mechanical skin irritation. This redness is temporary and usually limited to one or several areas. Pathological hyperemia appears in diseases accompanied by fever, if erythrocytosis (increased number of red blood cells). Limited hyperemia with a characteristic localization on the neck, cheeks, and nose and around the eyes is characteristic for disseminated lupus erythematosus (“lupus glasses”, “lupus butterfly”). Local hyperemia is accompanied by inflammation - inflamed joints, infiltrates and wounds.

Yellowness of the skin and sclera are best detected and evaluated in the light of day, in the glow of the blue bulb or fluorescent light. For a child (except a newborn) icterus is always a symptom of the disease (see "Blood", "Digestive system"). Icteric coloring of the skin may occur when using a large amount of food to child or drugs containing dyes (carrots, tangerines, quinacrine). In this kind of icterus (exogenous or false) it is colored only the skin, while in true (hepatic) icterus it is also yellowing of the sclera. In the first place it is usually appears yellow (icteric, subicteric) sclera, the lower surface of the tongue and soft palate.

Icteric has a various shades: lemon yellow hemolytic anemia, greenish in mechanical icteric, which is connected with accumulation of bile pigments in the blood, orange - in the initial stages of the disease when bilirubin begins to accumulate in the skin.

Cyanosis (blueness) appears in a falling content of oxyhemoglobin is below 95%. It is distinguishes total cyanosis, which affecting the whole body and regional: perioral - around the mouth, nasolabial triangle cyanosis, cyanosis of the distal parts of the body - tip of nose, earlobes, lips, tongue, hands and feet is called acrocyanosis. Cyanosis appears when the syndrome of respiratory disorders in newborns, especially in preterm infants, with pneumonia, atelectasis, pneumothorax, croup, ingestion of an extraneous body in the respiratory tract. Large degree of a cyanosis in congenital heart defects (in a copybook of Fallo). Bluish staining of the skin occurs when the methemohlobinemia due to nitrite poisoning (blood in this case is pale-lilac color).

In children it is much less frequently can be found the bronze color of the skin that occurs in chronic adrenal insufficiency. In a hypovitaminosis PP (pellagra) the skin has a dirty color. The discoloration can be limited. Example of local violations of the colors are limited to blue spots in the lumbar region, the sacrum, the abdomen, which reach the size sometimes of several inches, have a rounded or irregular shape. This discoloration of the skin is called by pigment cells located in the deeper layers of the skin. In 5-6 years those spots will disappear.

During the examination of the skin integuments we should pay attention to the development of venous system. Above mentioned venous pattern in the medusa head can occur with stagnation in the portal vein. Hydrocephalus and rachitis expanded venous system of the scalp, increasing bronchopulmonary nodes in the upper part of the back. Sometimes skin blood vessels form which called spider veins, slightly protruding above the skin level, with multiple branches. Spider veins

usually appear in chronic diseases of the liver and combined with red (liver) hands and feet. Angiomas and vascular tumors may reach considerable size, sometimes they grow into the underlying tissues and organs.

While examination it can reveal the folds of the skin hyperemia and maceration of the diaper rash (intertrigo), which is happened often in children with exudative-catarrhal and allergic diathesis (Pic. 16). The umbilical region of neonates should be examined especially carefully, as the umbilical wound is an open entrance for infection.

Morphological elements of the skin are an external expression of the pathological process, which occurring in the skin. Morphological elements are divided into primary and secondary. The primary concern is the rash that appears on the intact skin (spot, papule, tubercle, node, blister, mini-bubble, bubble, and abscess); secondary - rash, appearing as a result of evolution of primary elements (scales, hyperpigmentation, depigmentation, crust, ulcer, erosion, scar, lichenification, atrophy). The primary elements are divided into cavity, filled with serous, hemorrhagic or purulent content (mini-bubble, bubble, abscess), acoelomate (macula, papule, node, blister, bump).

Spot (macula) is a discoloration of the skin in a limited area, towering above the skin level and do not differ in density from the healthy areas of the skin. Spot size varies considerably from point to the vast, often irregular form. The spot size from a point up to 5 mm pale pink or red color called roseola. Multiple roseola 1-2 mm in size are described as petechial rash. Numerous spots of 5 to 10 mm formed small-spotted rash, spots ranging in size from 10 to 20 mm large-spotted rash, large stretches of congested skin are called erythema (erythema). The latter are formed as a result of the merger large-spotted rash, so the spots larger than 20 mm, having a tendency to merge are considered as erythema. The stains may be related to inflammatory process and due to the expansion of blood vessels of the dermis. These spots disappear when pressing on the skin with a finger or glass slide and reappear after cessation of pressure. Not inflammatory spots are stains resulting hemorrhage: petechiae - petechia, purpura, multiple hemorrhages rounded size from 2 to 5 mm, echymosis - hemorrhage irregular shape with a size of more than 5 mm. this group includes the spots associated with abnormal development of blood vessels - telangiectasia, vascular birthmarks, and hyperpigmented (liver spots, nevi) and depigmented spots (vitiligo) caused by impaired deposits in the skin melanin. In contrast to the inflammatory non-inflammatory spots disappear when pressing on the skin.

A spotted rash may occur in various pathological processes. Roseola rash is observed in typhoid and typhus fevers typhoid, paratyphoid A and b, syphilis; tiny point rash characteristic of scarlet fever; tiny point for rubella; large-spotted rash occurs in a measles, infectious erythema. Different types of hemorrhagic rash are the result of increased porosity of the vascular wall or of violation of its integrity during inflammatory processes, toxic effects, metabolic disorders, trauma.

Papule (papula) - limited, slightly raised above the skin formation with a flat or domed surface. It appears as a result of accumulation of inflammatory infiltrate

in the upper dermis or epidermis growths. The size of papules varies from 2-3 mm to several centimeters. The papules of large size are called plaques. Papules rash appropriates of measles, rubella, hemorrhagic vasculitis and other diseases.

Tubercle (tuberculum) is limited, dense, acoelomate element, acting above the skin surface and reaching a diameter of 5 - 10 mm. It appears in the result of formation in the dermis an inflammatory granulemis. Clinically tubercle similar to a papule, but to the touch it is denser and reverse the development in contrast to papules necrotic, leaving behind productive or atrophic scar, ulcer. The tubercles are distinctive for lupus erythematosus, leprosy, fungal infections of the skin.

Node (nodus) is a formation dense, acting over the skin surface or in its thick. It reaches the size of 10 mm or more. It is formed by the accumulation of cellular infiltrate in the subcutaneous tissue and the dermis. In the course of evolution, may ulcerate and scar. Large blue and red nodes, painful at palpation are called erythema nodosum. Non-inflammatory nodes observed in the skin tumors (fibroma, lipoma).

Blister (urtica) is an acute inflammatory element that occurs as a result of limited edema of the papillary layer of the skin. It is rising above the level of the skin; it has a rounded shape, size of 20 mm or more. It evolves quickly without leaving a trace. The appearance of blister is usually accompanied by severe itching. Urticarial rash is characteristic of allergic dermatoses.

Vesicle (vesicula) is a surface, slightly pronounced above the level of the skin filled with serous or bloody fluid formation.

Its size is usually in the range of 1 - 5 mm. In the process of evolution can dry out with the formation of a transparent or brownish crust, opened, revealing limited weeping erosion. After the resolution leaves a temporary hyperpigmentation (depigmentation) or disappears without a trace. When a cluster of bubbles of white blood cells it turns into a pustule (pustulae). The pustules may form and the primary, most often it is localized in the region of hair follicles.

Mini-bubble is a characteristic element of depriving the bubble, eczema, natural, and chicken pox.

Vesicle (bulla) is one of the elements like a bubble, but far exceeding it in size (3-15 mm or more). It is located in the upper layers of the epidermis and under the epidermis. It is filled with serous, bloody or purulent contents. It may dissipate forming crusts. It leaves behind slight pigmentation. It occurs when burns, acute dermatitis, dermatitis herpetiformis Duhring.

It is frequently may be found that various morphological elements while in an examination of unhealthy skin. Mixture of several types of rashes occurs in allergicdermatosis, measles (maculopapular), typhoid (rosealina-papular), etc.

Scale (squama) is a gathering of tearing away corneal plates of the epidermis. Scales can be different sizes: more than 5 mm (leaf peeling), from 1 to 5 mm (plate peeling), the smallest (pityriasis peeling). They are yellowish or grayish in color. Abundant pityriasis peeling gives the impression of powdery skin. The appearance of the flakes is observed after measles, scarlatinosis rash, psoriasis, and seborrhea.

Crust (crusta) is formed by the drying fluid bubbles, pustules, separated moist surfaces. Crusts may be serous (clear or grey), purulent (yellow), spotting (brown). Crusts on the cheeks in children with exudative-catarrhal diathesis are called milk scab.

Ulcer (ulcus) is a deep defect of the skin, sometimes reaching adjacent organs. The result of breakdown of the primary elements of the rash, disorders of blood and lymph circulation, injuries, trophic disorders.

The scar (cicatrix) is a coarse connective tissue that performs a deep skin defect. Fresh scars are red color, but over time they fade.

When describing the elements of a rash you must follow certain rules. You need to set the time of occurrence, localization, size and number of elements, their shape and color. It is identified all parts of the body, which has a rash, revealed the preferential localization (head, torso, flexor or extensor surfaces of the limbs of large folds of skin, etc.). It distinguishes unit cells by its number (indicated the exact number), scant rash (fast counting during the examination), profuse rash (multiple counting elements). The size of the elements measured in millimeters or centimeters on the most developed and dominant elements. Shape is described as rounded, oval, irregular, stellate, etc. It pointed out that the clarity or fuzziness of the edges. Special attention is paid to the color of the rash. Inflammatory the rash has a red shade of color from pale pink to bluish-purple. The description of the colors of hemorrhagic rash, changing in the process of evolution, we have to use blue, purple, yellow colors. It should be noted features of the secondary elements of the rash: the nature and localization of peeling, time of falling away crusts, etc.

Palpation should be superficial, it will have to be careful not causing the child pain, especially on the location of inflammatory infiltrates. The doctor's hands should be clean, warm and dry. Monitor the facial expressions of the child, talking to distract the child's attention from the survey.

Using palpation is determined by the thickness and the elasticity, moisture and skin temperature.

To determine the thickness and elasticity of the skin in need of thumb and forefinger to grab the skin (without subcutaneous fat layer) in a small crease, then the fingers have to take. If the skin fold is straightened immediately after removal of fingers, skin elasticity is normal. If smoothing skin folds occurs gradually, skin elasticity, reduced. Grab the skin fold should be where there is little subcutaneous fat layer: on the dorsum of the hand, on the front surface of the chest over the ribs, the elbow. It is possible to estimate the elasticity of the stomach. Of particular importance is the definition of the elasticity of the skin in children of early age.

Moisture is determined by stroking the skin with the fingers of the doctor on the symmetric parts of the body: chest, torso, in the armpits: and groin, extremities, including palms and soles. Particularly important is the determination of the humidity on the palms and soles in children of pre-pubertal age. Determination of moisture content of the skin on the back of the head is of particular diagnostic value in infants. Normal baby skin has a moderate humidity. In a diseases skin can be dry, high humidity or excessive sweating.

Palpation determined by the temperature of the skin. Patients' skin temperature can be high or low depending on the total body temperature. Perhaps a local increase or decrease in temperature. Local temperature rise is inflammation of the joints, cold extremities - when spasm of blood vessels, in the defeat of the central and peripheral nervous system.

To determine the state of blood vessels, especially their increased brittleness that is used by multiple symptoms.

Symptom harness (a symptom of Konchalovskiy - Rumpel - Leed). Rubber band or a cuff from the apparatus for measuring blood pressure imposed directly on the middle third of the shoulder. The force with which overlaps with the wiring, need to stop venous return without disturbing blood flow, i.e. the pulse at the radial artery should be preserved. When applying the cuff, the pressure in it increases to a level not exceeding systolic. After 3 - 5 min. carefully inspect the skin of the elbow and forearm. Usually the skin is not changed, however, with increased fragility of blood vessels appears on the skin petechial rash. Pathological is the appearance of petechial more than 4-5 items in a square elbow.

Pinch symptom. It is necessary to capture a fold of skin (without subcutaneous fat layer), preferably on the front or side surface of the breast, the thumb and forefinger of both hands (distance between the fingers of the right and left hands should be about 2 - 3 mm) and move her pieces across the length of the folds in the opposite direction. The appearance on the site pinch of hemorrhage is a positive symptom.

Hammer symptom. It produces tapping moderate strength, does not cause pain in the child, the percussion hammer in the sternum. The symptom is considered positive in the appearance on the skin of hemorrhage.

Additional methods of skin research include the definition of dermographism. Dermographism research is made by carrying out from top to down the tip of the index finger of the right hand or the handle of the hammer on the skin of the chest and abdomen. After some time in place of mechanical irritation of the skin appears white (white dermographism) or red stripe (red dermographism). It pointed out the form of dermographism (white, red), the speed of its appearance and disappearance, dimensions (diffuse or nerability).

7.3 Hypodermic fatty layer

The formation of subcutaneous fat layer starts at the fifth month in fetal development. At the end of fetal development and during the first year of life the increase of adipose tissue occurs mainly at the expense of fat cells. Systematic overfeeding children can lead to an excessive number of adiposities that causes the most persistent and severe forms of obesity. In neonates and infants subcutaneous adipose tissue has a number of features:

The fat cells are smaller and contain a nucleus; over time, fat cells increase in size, and the nucleus, on the contrary, decrease.

The ratio of subcutaneous fat in children is 1 year to the mass of the body relatively larger than in adults, which explains the rounded shape of their body.

In the thoracic and abdominal cavities, the retroperitoneal space accumulation of adipose tissue is almost absent. They only appear in 5 - 7 years and mainly in the period of puberty. This is due to the easy removability of the internal organs (e.g., kidneys).

A feature of the subcutaneous tissue in newborns and infants is saving in her tissue embryonic character with as a fat storage and blood forming function.

The presence of clusters of brown adipose tissue is an essential feature of subcutaneous fat in children newborn period and the first months of life. This fat intensively differentiates and collected starting from the 13^{th} week of fetal development. Histologically, the cells of brown adipose tissue differ from cells of the white adipose tissue of the large numbers of fat vacuoles, their small size, and richness of the cell mitochondria. The term newborn total amount of brown adipose tissue contains from 30 to 80 g, or 1 3% of total body weight. The greatest accumulations are at the back of the neck area around the thyroid and thymus glands, axillary region, supralocal area and around the kidneys. Smaller areas are located in the interscapular space, in zones of trapezius and deltoid muscles, as well as around major vessels. The main function of brown adipose tissue is the so-called non-contractile thermogenesis, i.e. heat production are not connected with muscle contraction. Under the influence of cold stimuli is release of a hormone of the sympathetic endings is norepinephrine, acting directly on the metabolism of brown adipose tissue. The result of the action is the hydrolysis of triglycerides and oxidation of released fatty acids to carbon dioxide and water with considerable liberation of heat. The maximum capacity for heat production of brown adipose tissue is determined in the first days of life. Stocks this fabric in full-term child can provide protection from moderate cooling for 1-2 days. With age, the ability of brown adipose tissue to heat production is reduced. The disappearance of brown adipose tissue occurs within a few months. In children exposed to prolonged cold, brown adipose tissue may disappear completely. At starvation firstly disappear white adipose tissue and only for large stages and degrees of starvation it is disappear brown. So in distrhophyrotic children the propensity for cooling sharply increases. Deeply prematurely born children with a small reserve of brown fatty tissue are very easily cooled and need warming.

To the birth of the subcutaneous fat is more developed on the face, legs, chest, back. In these areas the fat layer reaches its maximum development in 6-week belly - to 4 - 6th month. His disappearance in the case of the disease occurs in reverse order, i.e. first the abdomen, then on the limbs and torso, the last place on the face.

It is happen with age and changes in the composition of fatty tissue. In the newborn, the actual fat accounts for only 35.5 percent for the first year, the fat is already 56% and in adults from 60 to 90% of the fatty tissue. It will be change the ratio of the various components of the fat.

The determination of the amount of fat in the body has a diagnostic value. The children on the amount of fat or are judged on the basis of the ratios of length and of body weight or on the thickness of the skin folds.

There are significant differences in the content of adipose tissue in boys and girls. They are expressed especially sharply when they reach sexual maturity. So, the girls have low severity of muscular topography of the body and roundness of forms of due to the fact that more than 70% of the fatty tissue falls in the subcutaneous fat, while the boys of the subcutaneous fat layer is only about 50% of the total body fat mass.

7.4 Research method of the hypodermic fatty layer

General idea of the quantity and distribution of subcutaneous fat layer can be obtained by examination of the child, but the final judgment about the condition of the subcutaneous fat layer is made only after palpation.

To assess subcutaneous fat layer need deeper palpation than in the study of the skin: the thumb and forefinger of the right hand being a fold not only the skin but also the subcutaneous tissue. To determine the thickness of the subcutaneous fat layer should not one area, as a number of diseases, the deposition of fat in various places are uneven. Depending on the thickness of subcutaneous fat there are talking about normal, excessive and insufficient deposition of fat. It pays attention to the uniform (over the body) or the uneven distribution of subcutaneous fat layer. To determine the thickness of the subcutaneous fat layer is recommended in the following sequence: first, the abdomen at the umbilicus and laterally from him, then on his chest, near the sternum, on the back under the shoulder blades on the extremities - on the internal back of the thigh and shoulder, and finally on the face in the cheeks.

More objectively, the thickness of the subcutaneous fat layer is determined by the caliper on the sum of the thickness of 4 skin folds on the biceps, triceps, below the scapula, above iliac bone (tab. 13-15).

Table 13. **The sum of the thickness of 4 skin folds in children 3 to 6 years.**

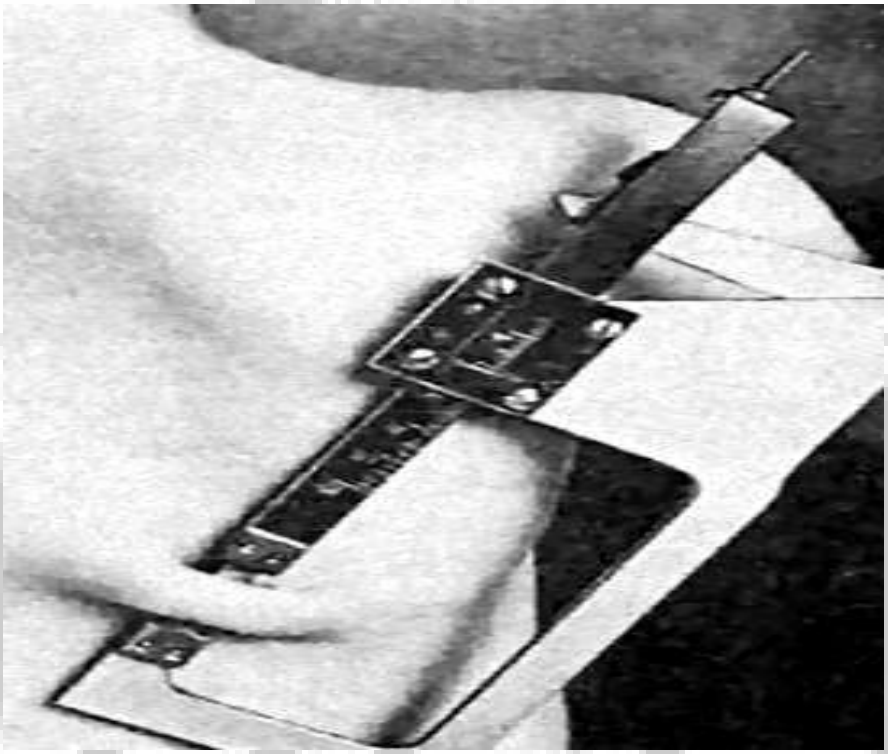
Centiles	Age in years							
	3		4		5		6	
	boys	girls	boys	girls	boys	girls	boys	girls
5	20,5	21,3	17,9	20,0	17,9	18,4	16,2	18,5
10	21,9	22,8	18,7	21,4	18,8	19,3	17,1	19,5
25	23,9	24,6	21,4	24,4	20,6	21,9	19,3	22,7
50	26,7	28,1	24,4	27,9	23,4	25,5	21,9	26,2
75	29,1	32,1	27,6	30,9	25,8	30,9	25,5	31,6
90	33,0	36,6	30,7	35,5	28,9	35,4	32,7	40,8
95	34,8	46,8	31,6	38,3	32,7	42,3	37,3	65,5

Table 14. **The sum of the thickness of 4 skin folds in boys 7 – 15 years.**

Centiles	Age in years								
	7	8	9	10	11	12	13	14	15
5	14	15	19	14	17	21	21	21	19
15	21	20	22	21	22	24	25	25	23
35	25	25	26	28	29	30	32	32	29
50	28	28	29	33	33	35	37	37	34
65	32	33	34	38	38	40	44	44	39
85	40	45	44	57	59	51	60	68	50
95	55	68	65	83	96	79	80	90	67

Table 15. T**he sum of the thickness of 4 skin folds in girls 7 – 14 years.**

Centiles	Age in years							
	7	8	9	10	11	12	13	14
5	17	17	20	21	20	23	25	23
15	23	22	25	26	25	29	32	39
35	29	28	33	35	34	36	42	48
50	34	32	37	41	40	41	52	55
65	38	37	42	49	47	50	55	64
85	47	48	58	61	60	63	65	78
95	57	61	71	83	88	94	75	94



Pic.17. Measuring skinfold thickness with a caliper.

While in a depth assessments of physical development uses special tables and nomograms that allow the sum of the thickness of skin folds accurately calculate the total fat and active (fat-free) body weight body (Pic. 17).

Palpation should pay attention to the consistency of the subcutaneous fat layer. In some cases the subcutaneous fat layer becomes dense, and in some small areas or entire or almost the entire subcutaneous tissue (sclerema). Along with the seal may occur and puffiness of the subcutaneous fat layer - scleredema. Swelling of the seal is characterized in that in the first case, when pressing, a recess is formed, which gradually disappears, in the second case the hole when pressed is formed.

You should pay attention to the presence of edema and incidence (on the face, eyelids, limbs, general edema - anasarcae or localized). Swelling can be easily seen if they are well expressed or localized on the face. To determine the presence of edema in the lower extremities it is necessary to press the index finger of the right hand in the area of the lower leg over the tibial bone. If when pressed it turns out the hole, disappearing gradually, so it is true swelling. If the hole disappears, it indicates mucous edema. In a healthy baby the hole is not formed.

Determination of turgor of soft tissues. It is performed by squeezing the thumb and forefinger of the right hand skin and all soft tissue on the inner thigh and shoulder. While there is resistance or elasticity, is called turgor. If you have younger children, the tissue turgor is reduced, when compression is determined by their feeling of lethargy or laxity.

8. MUSCULAR SYSTEM

Muscle mass relative to body mass in children much less than adults. For newborn it is 23.3% of the body weight, child 8 years of 27.7%, 15 years is 32.6% and the adult - 44,2%. The total increase muscular tissue mass in postnatal development is 37-fold, while the mass of the skeleton is increased only 27 times. Any other fabric does not increase after birth. The distribution of muscle tissue in the newborn is different from children of other age groups and adults. Its main weight falls on the muscles of the torso, while in other periods the muscles of the extremities. Feature newborns and is a significant predominance of muscle tone-flexor. Due to the increased tone of the flexors in utero there is a specific posture of the fetus.

With age it will be change a histological structure of muscle tissue due to the thickening of the myofibrils. So , if a newborn in the diameter of muscle fibers is on average about 7 microns to 16 years, he is 28 μm, and more. In parallel with the growth of myofibrils, the number of nuclei per unit area of the fabric decreases (from 45 newborn to 5 boys 17 years).

In parallel with the development of muscle fibers is the formation of connective tissue skeleton of the muscle - endomyzium and perimisium that reach final differentiation to 8-10 years.

Receptive apparatus of the muscles have already formed by the time of birth of the child. Spindle-proprioreceptor actively operate even in utero. In subsequent years there is only redistribution: they concentrate on those areas of your muscles that are under the greatest tension.

Motor nerve endings, appearing even in the early stages of fetal development, at birth is built according to the embryonic type. In the first months and years of life continues to increase in the number of terminal branches and area of nerve endings. There is a certain parallelism in the development and differentiation of the endings and the possibility of new rapid motor acts in children.

Functionally the muscles of the child are characterized by various features. There is an increase in sensitivity to some humoral agents (acetylcholine) and a significant decrease in sensitivity to electrical current. Skeletal muscle in utero are characterized by a low excitability. Muscle plays only 3 to 4 cuts per second. With age, the number of cuts reaches 60 - 80 per second. Gradually formed a tetanus.

Maturation of neuromuscular synapse leads to a significant (4-fold) acceleration of the transfer of excitation from nerve to muscle.

In newborns compared to adults, even during sleep the muscles do not relax. The constant activity of skeletal muscles is determined, on the one hand, their participation in reactions of the contractile thermogenesis (heat production), and on the other part of this activity and muscle tone in the anabolic processes in the growing organism, especially in stimulating the development of muscle tissue.

Indicators of chronaxie newborns are several times higher than those of adults.

Muscular work performed for 1 min and measured for the flexors of the index finger increases from 290 kgm in 7 years of age up to 1000-1200 kgm in 16-18

years. The highest rates of recovery of muscle health after standard rest duration of 1 min was observed in children aged 7 - 9 years old; after that age the recovery is worse.

The intensity of growth of muscular strength is different in boys and girls. As a rule, indicators of dynamometry are higher for boys than girls. However, at the age of 10 to 12 years in terms of the tripod of power girls are stronger than boys. The relative muscle strength (per 1 kg of body weight) remains almost the same up to 6 -7 years, and then rapidly increases to 13-14 years. The ability to quick movements reaches its maximum by 14 years. Muscular endurance measured by the maximum time of tension in the muscles with a force equal to half the maximum, reaches to 17 years values twice higher than the similar value in 7-year-old, the highest increase in endurance observed in the period from 7 to 10 years.

Biochemical composition of muscle in children differs from that of adults. So, the content of myofibrillar proteins in muscle tissue of newborns is approximately 2 times less of their content from older children and adults. An important qualitative feature is the presence in the muscles of children fetal forms of myosin, has a peculiar structure, reduced ATP and relatively high cholinesterase activity on the growth of the child these differences, smoothed, and fetal myosin disappears. In parallel, it will be increase the content of tropomyosin in muscle tissue. In addition, naturally increases the amount of sarcoplasmic proteins and decreases with age the amount of glycogen, lactic acid and nucleic acid relative to the weight of muscle tissue. Is significantly reduced and the water content in the muscles.

Muscle development in children is uneven. First and foremost, it will be develop the large shoulder muscles, forearms and later the muscles of the hands. Children cannot do easy things with their fingers to 6 years. At the age of 6 - 7 years the child can already successfully engaged in such work as weaving, sculpture, etc. At this age, it is possible to learn to write gradually. However, the exercises should be short to avoid overwhelming fragile muscles of the hands.

From 8 - 9 years children have stronger ligaments, increased muscular development and reported a significant increase in muscle volume. At the end of puberty is muscle gain not only hands, but also the muscles of the back, shoulders and legs.

After 15 years of intensive development and fine muscles, improving accuracy and coordination of small movements. Given these characteristics, the physical activity must be strictly dosed, should not be conducted at a fast pace (control the school physician in physical education classes).

Developing motor skills in children is not evenly distributed and unevenly and it is connected with the peculiarities of the neuroendocrine regulation. So, in 10-12 years, movement coordination is perfect enough. However, the younger and partly older still incapable of a long productive physical work and prolonged muscle tension.

These features of children and adolescents provided by the labour legislation, according to which child labour is prohibited and the teenagers have reduced working hours, additional leave and they are forbidden to work in hazardous enterprises.

In puberty the harmony of movement is disturbed: there is the awkwardness, the angularity, the sharpness of the movements as a result of the intense disharmony between the increasing weight of the muscles and the lag of regulation.

For normal muscle development in children and teenagers it requires only moderate physical exercise (sports and physical labor). Stimulation of the children to the movement, creating patterns of behavior, focused on high motor activity is an important task of education. Therefore, in the complexes of the classroom even with children of the first year in his/her life provides a special stimulation techniques movements (e.g. turning over, crawling, etc.) it is widely used massage and gymnastics for children of all age groups. In the construction of children's institutions provides facilities and special areas for physical education classes.

It has been created and standards of physical activity of children of different age groups. If a unit to take 1 step recorded by the pedometer, for children 3 to 4 years the norm is from 9000 to 10500 movements a day, and for students 11 – 15 years – about 20,000 steps. In temporal terms, it means that the children must be in a condition of motion from 4 – 41/2 to 6 hours a day. It must be borne in mind when conducting educational work with children and adolescents (table. 16).

Hypokinesis (reduced range of motion) is currently a factor that reduces the level of children's health. Hypokinesis determines the occurrence of such pathological states as obesity, vegetative-vascular dystonia. However, excessive uncontrollable passion for children's sports, attempt to achieve the highest possible results in a short time also represents a real threat to the health of children and can lead to serious consequences (table. 17).

Table 16. **Rules of movement, speed of pedestrians and the mass of the carried load.**

Duration of a campaign	5-6 forms			7-8 forms			
	Length of the route, km	Speed of the transition, km/h	weight, kg	Length of the route, km	Speed of the transition, km/h	weight, kg	
						girls	boys
One-day	12	3 – 3,5	2 - 4	16	3 - 4	3 - 5	5 - 6
Two-day	22	3 – 3,5	2 - 4	30	3 - 4	3 - 5	5 - 6
Three-day	23	3	2 - 4	40	3 - 4	3 - 5	5 - 6
Multi-day	45 (6 days)	3	2 - 4	120 (12 days)	3 – 3,5	3 - 5	5 - 6

Duration of a campaign	9 – 10 forms			
	Length of the route, km	Speed of the transition, km/h	weight, kg	
			girls	boys
One-day	12	4 – 4,5	4 - 8	8 - 10
Two-day	22	3,5 – 4,5	4 - 8	6 - 10
Three-day	23	3 - 4	4 - 8	6 - 10
Multi-day	45	3 – 3,5	4 - 8	6 - 10

Table 17. **The permissible age for sports**

Type of sports	Age (in years), which is allowed			
	Beginning of classes in the children's sport school	Participation in competitions		
		intra-school	all-union and youth	for adults
Acrobatics	10	11	17	19
Basketball	10	11	17	19
Boxing	14	15	17	19
Fighting	14	15	17	19
Cycling	14	14	16	19
Water polo	12	13	15	19
Volleyball	11	11	17	19
Artistic gymnastics	10	10	16	18
Sport	9	11	15	19
Rowing	14	15	17	19
Canoe	13	15	17	19
Horse riding	12	13	16	18
Speed skating	13	13	17	19
Athletics, including:				
running on average distances	-	-	17	19
running on long distances	-	-	-	19
Skiing	10	11	17	19
Ski jumping	12	13	17	19
Biathlon	10	13	17	19
Slalom	10	11	17	19
Table tennis	11	11	15	17
Sailing sport	12	14	17	19
Swimming	10	11	13	17
Diving	9	11	15	19
Handball	13	13	17	19
Modern pentathlon	12	13	17	19
Shooting	14	14	16	19
Tennis	8	11	15	19
Weightlifting	15	15	17	19
Tourism, including:				
hiking on ski	11	-	-	-
bicycle, boat races	-	12	-	-
Fencing	11	11	17	19
Figure skating	7	9	13	17
Football	13	13	16	18
Hockey	11	13	16	19

8.1 Research method of muscular system

Research of the muscular system begins with the examination. Looking around and then by sensing the individual muscle groups, you need to make an impression on muscle mass. In healthy children, physical development which

corresponds to age and sex, the muscles supple, equally developed on the symmetric parts of the body. Decrease in muscle mass, their laxity is characteristic of severely ill, malnourished children, leading a sedentary lifestyle, in some forms of eating disorders, etc. Extreme underdevelopment of the muscles (atrophy) occurs in children with progressive muscular dystrophy, in neuritis, poliomyelitis, rheumatoid arthritis. Increased muscle mass (hypertrophy) is usually associated with systematic sports and is rarely a symptom of the disease. On the development of muscles to a certain extent can be judged by the shape of the abdomen and position the shoulder blades. In weak muscles, the abdomen is pendulous, the relief of the muscles are not articulated. Good development corresponds to inverted or slightly jutting stomach, pulled up to the chest of blade. When determining muscle mass in young children sometimes meet difficulties. This is due to feebly marked relief of muscle and a good development of the subcutaneous fat layer. The fat deposition may simulate the picture of the well-developed muscles (pseudohypertrophy). To resolve this issue it follows to determine the thickness of the subcutaneous fat layer.

External examination reveals the asymmetry of muscle mass - unequal degree of development of the homonymous muscle groups. You must consistently compare the development of the muscles of both halves of the face, right and left side of the trunk, right and left limbs. Inadequate muscle development in children depends on many factors: poor nutrition, prolonged bed rest, minor physical activity. Rarely, it is connected with congenital diseases (myopathies and myasthenia gravis), peripheral neurons or joints.

Muscle wasting in children is accompanied by decrease in tone, which is manifested in the increase in the stomach, sharply mentioned lordosis of the lumbar, wing blades, incorrect posture. Asymmetry of the muscles of limbs is easy to install, making comparative measurements of the circumferences of the shoulders, forearms, thighs, shins on a strictly equal levels. Muscle asymmetry may be connected with congenital hypoplasia, traumatic muscular strain, diseases of the nervous system.

The most important indicators of the state of the muscular system are tone, strength, and motor activity.

As the muscle tone is assessed by several techniques. A rough idea can be obtained by visual assessment of posture and position of limbs of the child. The study of muscle tone can even provide a guide to the gestational age of the newborn. So, deeply premature baby lies with outstretched limbs and passively turns from back to side. At the age of 27 - 30 weeks he continues to lie on the back with outstretched arms and legs. After 30 weeks, there is bending the legs at the knee and hip joints, but the hands still remain outstretched until the age of 34 weeks gestation. Subsequent increases in flexion of the upper extremities, and 36 - 38 weeks, there is full flexion of arms and legs. Hands after extension remain in the extended position. However, at the age of 40 weeks extension of his hands immediately returned to its original position.

In healthy full-term newborn arms bent at the elbows, knees, and thighs tied to the stomach. Have sprawled on the table of the child with outstretched arms and legs, muscle tone is reduced (hypotonia). The presence of increased tone (hypertonicity) of the extremities can be assumed in that case observed:

a) Compression of the fingers into a fist; b) fin position of the hands is the stress placed fingers slightly bent brush ;) "claw" - straightening the fingers at the metatarsophalangeal or metacarpophalangeal joints during their flexion in the interphalangeal; g) acetone the position of the hands, the fingers straightened, stretched and are in different planes; d) the position of opisthotonos is elongated and tense limbs, head thrown back dramatically.

Identified overhang arm or leg and its non-participation to the common motor responses of the child can point to isolated or limited loss of muscle tone or flaccid paralysis while in observing. Muscle tone is determined by palpation. Alternately palpate different muscle groups, passive bending and unbending of limbs. Lethargy and laxity of the muscles indicate hypotension; tension, density and sometimes the resulting reaction of the child testify to the hypertension of muscles.

For judgments about muscle tone can use some special techniques. For a newborn with hypertonicity of the flexors it follows to use the symptom return. To check the baby's legs, lying on her back, gently unbend and straight as pressed against the table for 5 seconds. Then the doctor removes his hands and feet of the child is immediately returned to its original position. With a small decrease in the tone of a full refund is not happening. After removing the physiological hypertonicity use the following method: clasping her hands, the doctor gently moves it in a vertical position upside down. During normal muscle tone of the head is in the same vertical plane with the body, but not hanging, arms bent slightly and legs extended. About lowering the tone of they say hanging head and feet, and in the most severe cases, muscle weakness and hands. Increased tone in this sample is manifested by increased flexion of the arms, legs and tilting the head.

Muscle tone of the upper extremities in an infant is tested for breakdown traction. The child, lying on the back, is taken by the wrists and gently pulled forward, trying to bring him to a sitting position. First, the child extends his hands, and then (second phase) whole body tightened, as if helping the doctor. In a high tone is missed the first phase - extension, reduced tone - tightening.

When assessing possible causes of a change in muscle tone should be mindful of the fact that premature infants and immature children may have overall muscle hypotonia up to 11/2 - 2 months of life; occurring then they have hypertension flexors may persist until 5 - 6 months of life. The term newborn, the change of muscle tone, usually associated with damage to the Central nervous system due to intrauterine pathology, birth trauma, asphyxia or hyperbilirubinemia.

In infants and older ages the causal factors can be infection - encephalitis, meningitis, skull fractures, acute and chronic malnutrition, water-salt metabolism, deficiency of vitamin D. In the first months and years of life on persistent decrease in muscle tone and connecting impaired motor skills of the child are identified and congenital muscle disease, neuro-muscular synapses and anterior horn of the spinal cord (myopathy, myotonia).

The resaerch of passive movement is flexion and extension of the joints of the child. In infants and children the first 4 months of life there is some limitation of motion of the joints connected with the physiological hypertonia of the muscles. For normal amounts of movements in the joints of children of this age can accept the following parameters: the extension of the arms at the elbow perhaps up to 180°; flexion at the wrist joint - to 150°; breeding hips - 75° in each direction; extension of the leg at the knee joint when flexed at a right angle thigh - 150°; dorsal flexion stop may of 120°; head rotated to side, chin touches the acromion process; when moving hands to the opposite fingers reach the acromial end.

The limitation or impossibility of passive movements may be associated with increased muscle tone and joint involvement. The increased range of passive movements, "staggering" (relaxation) of the joints indicate a decrease in muscle tone.

Active movement is studied with the observation of a wakeful child, or while playing with it. Engaging a child's toy, he is forced to bend, straighten, raise hands and lower them, to squat, to stand up, going. Older child can do simple gymnastic exercises at the command of the doctor. When observing a child it is possible to identify the restriction or absence of movements in individual muscle groups and joints that is marked with the defeat nervous system (paresis, paralysis), anatomical changes of muscles, bones, joints, pain.

To determine the strength of the muscles requires the active participation of the subject. A small child should try to take under control them a toy. Older child at the request of the doctor resists the straightening of the limbs. To more accurately evaluate the muscular power allows the use of manual and torso dynamometers.

Among the instrumental methods of the study of the muscular system use the definition of mechanical and electrical excitability myography. Electromyography is a method of registration of bioelectric activity of the muscles. Clinical and electromyographic studies provide an opportunity to identify subclinical manifestations of motor abnormalities, helping to clarify the localization process, to differentiate motor disorders caused by lesions of the central or peripheral nervous system, or muscular system. Neurological lesions marked activity characterized by large potential; myogenic lesions of the amplitude and duration of potentials do not change. In infants there is a rapid fatigue, the amplitude gradually decreases until the complete disappearance bioelectrical activity. Chronaximetry is a method of determining the minimum period of time of applying bioelectrical activity of muscles contraction. This method can detect increased muscle tension. Widespread in recent years acquired biochemical studies in congenital diseases of the musculoskeletal system with the definition of the level of amino acids, enzymes in the blood and urine, and examination of bioptate of muscles.

9. BONE SYSTEM

Osteogenesis in the person is unique and has no analogs in other animals (plate-trabecular structure of the bone osteon channels - haversian canals). The final structure of the bone formed after birth, which coincides with the start of a steady walk. At the same time and in utero tab and bone formation occurs later (at 5 weeks) other systems of the body.

Future skeleton is formed in certain areas of the body of the embryo from the accumulation of mesenchymal cells, which II the month (5 - 8th week) fetal development become a membrane (the eardrum). In the process of ontogenesis, there are two ways of formation of bone tissue: dermal (connective tissue) and chondral (cartilage) bone formation. The first way is peculiar to the bones of the cranial vault, facial bones, the mandible and the diaphysis of the clavicle, i.e. directly from mesenchyme without first converting to the cartilage. All other parts of the skeleton occur in the stage of cartilage, formed from accumulations of mesenchyme.

By the time of birth, the diaphysis of long bones already presented bone tissue, while the vast majority of the epiphyses, all spongy bones of the hand and of the cancellous bones of the foot are still only cartilage. The birth planned only point of ossification in the Central portions of adjacent epiphyses of the femur and tibia, talus, calcaneus and cuboid bones, in the bodies of all the vertebrae and their arches. After the birth there are other points of ossification. Their sequence of appearance quite some (time their x-ray identification are presented in table 18). A set have the points of ossification is an important characteristic of its level of biological development called bone age.

Table 18. **The terms of ossification of the skeleton of hands and distal forearm in children and adolescents**

Points of ossification and synostosis	The most earliest period		The most recent period		Average period	
	boys	girls	boys	girls	boys	girls
Capitate and hamular bones	1 months 6 months	1 months 4 months	10 months	8 months 1 ½ years	3 - 4 months	2-3 months
Distal epiphysis of radius			2 years		10 - 12 ”	8 – 10 ”
Epiphyses of the main phalanges and metacarpal bones	10 months	8 months 10 months	3 years	2 ½ years 3 years	15 - 18 ”	10 – 12 ”
Epiphysis of an average and terminal phalanges	1 years 1 ½ years 2 years	1 years 2 years	3 years 5 years 6 years	4 years 4 ½ years	20-24 ” 3 – 3 ½ ” 3 ½ - 4 ”	12 – 15 ” 2 – 2 ½ ” 2 ½ - 3 ”
Triangular bone		3 ½ years		6 years		
Semilunar bone	4 years	5 years	8 years	8 years	5 ½ - 6 ”	4 – 4 ½ ”
Multangular and navicular bones	6 years 7 years	6 years 7 years	10 years 12 years	10 years 11 years	7 - 7 ½ ” 9 ½ - 10 ”	6 – 6 ½ ” 7 ½ - 8 ”

Distal epiphysis of ulna	10 years	9 years	13 years	13 years	11 – 12 ”	8 ½ - 9 ”
Styloid process of ulna	11 years	12 years	15 years	15 years	13 ½ - 14 ”	11 – 11 ½ ”
Sesamoid bone of I metacarpophalangeal joints	14 years	12 years	17 years	16 years	15 ½ - 16 ”	12 ½ - 13 ”
Synostosis of I metacarpal bones	14 years	12 years	18 years	17 years	16 – 16 ½ ”	13 ½ - 14 ”
Synostosis of terminal phalanges	14 years	12 years	19 years	17 years	16 ½ - 17 ”	13 – 15 ”
Synostosis of the main phalanges	14 years	12 years	19 years	17 years	16 ½ - 17 ”	15 ½ - 16 ”
Synostosis of average phalanges	16 years	14 years	20 years	18 years	16 ½ - 17 ”	15 ½ - 16 ”
Synostosis of II-V metacarpal bones	16 years	13 years	19 years	17 years	16 ½ - 17 ”	16 ½ - 17 ”
Synastosis of distal epiphysis: radius	16 years		19 years		18 – 19	15 ½ - 16 ”
ulna					17 – 19	

The growth of bones in length till the appearance in the epiphyses ossification of the points is carried out to the development growth of cartilage forming the end sections of bones. After the appearance of the points of ossification in the epiphyses of elongation occurs through the development of growth cartilage, located between the partially closed epiphysis and metaphysis, i.e. meta-epiphyseal area and the epiphyses increase as a result of a similar process in growing cartilage surrounding the corresponding points of ossification. It is simultaneously with the lengthening of the diaphysis of long bones increase in diameter. This is the result of ongoing bone formation process on the part of the periosteum; with the bone marrow space cortical layer undergoes continuous resorption. The consequence of these processes is the increase in diameter of bones and increase in bone marrow space.

In the first months and years of life, along with the intensive growth of the skeleton occurs and multiple restructuring of bone tissue, reflecting its phylogeny from coarse structures to lamellar bone with secondary rudely-fibrous structures. Intensive growth with simultaneous intensive histological remodulation creates bone very special situation in which bone tissue is very sensitive to adverse environmental effects, especially to eating disorders, motor mode of the child, status of muscle tone, etc. Biodynamics of bone tissue in children 1-St year of life is 100 - 200%, 2nd - 50 - 60%, 3 -7-go - 10%, after the 8th year of life - a little over 1 % with some increase in the pre-pubertal period drawing. These characteristics of the updates relate to cortical bone and to trabecular bone they are 3 - 10 times higher. Intensive osteogenesis and re-modulation are accompanied by a significant decrease in the density and hardness of bone tissue in children of early age with

simultaneous increase of flexibility of the bones and their penchant for a variety of deformations. Hardness of bone depends on the degree of substitution of the cartilaginous tissue of osteoid and the degree of mineralization, i.e. formation of true bone tissue. The content of the main mineral component of bone is hydroxyapatite in children increases with age (table. 19).

Table 19. **The content of calcium in the skeleton of a baby**

Age	Content of calcium in grams	Age	Content of calcium in grams
Newborn	28		
1 years	100	10 years	296
2 years	147	11 years	463
3 years	179	12 years	539
4 years	201	13 years	624
5 years	219	14 years	715
6 years	239	15 years	806
7 years	264	16 years	894
8 years	297	17 years	973
9 years	341	18 years	1035

In the process of bone formation and remodeling there are three stages. The first phase of osteogenesis is an intensive anabolic process during which creates a protein framework of the bone – matrix. This process requires normal maintenance of the child in protein, vitamins A, C, group B. the Hormones regulating the formation of the matrix are thyroxine, somatomedins, activated by somatotropic pituitary hormone, insulin, parathyroid hormone.

In the second stage is the formation of centers of crystallization of hydroxyapatite and subsequent mineralization of osteoid. This stage is crucial to the provision of body calcium, phosphorus, trace elements (fluorine, manganese, magnesium, zinc, copper), vitamin D. the second stage can be broken with the shift of ρH of the blood to the acid side. Disruption of normal bone formation in children of early age can be very easily influenced by an unbalanced diet, various acute and chronic diseases. In addition, both stages of osteogenesis are regulated by the muscular tone and movements. Therefore, massage and gymnastics contribute to the activation of osteogenesis. Prolonged immobilization leading to hypokinesia, disrupts the digestion process and causes osteoporosis.

The third stage of osteogenesis is the process remodeling and continual self-renewal the bone, which are regulated by the parathyroid glands and depend on vitamin D. the Process of bone formation, provided the normal level of calcium. The constancy of the calcium level in the serum is very stable (2, 44 + 0, 37 mmole/l, or about 0.98 ± 0.015 g/l). Normal regulation of calcium metabolism and the maintenance of its stability in the blood is carried out via the change in the speed of intestinal absorption and renal excretion. In case of insufficient calcium in the diet or poor absorption of calcium from the intestine, what happens when vitamin D, blood calcium level begins to be supported mainly by resorption of calcium from bones.

Intensive growth and remodulation of bone tissue supports specific to children's age the abundant blood supply to the bones, especially in the areas enchondral ossification. The number of diaphyseal arteries in children and their area of branching is much greater than in an adult. Blood supply metafit and epiphysis is well developed metaphyseal and epiphyseal arteries. By age two, is developing a unified system of intraosseous circulation associated with well-developed, punching sprout cartilage epimetaphyseal vessels. The intensive blood supply of bone tissue is the basis of frequent occurrence in children hematogenous pyogenic osteomyelitis in metafisix and the epiphyses. After 2 years with decrease of speed of growth and transformation of the bone tissue, the number of vessels bones significantly decreases and again increases by the time pre-pubertal and pubertal growth acceleration.

Feature of children's skeleton is relatively large and the thickness and functional activity of the periosteum, through which processes of tumors of the bone in transverse bone growth. At the same time, the volume of intraosseous spaces (cavities) is relatively small and formed with age. The bones of children are relatively smooth according to the structure of their surfaces. Bony prominences are formed and drawn to as strengthened and begin to operate the muscles. Only 12 years of appearance and histological differentiation of bone tissue close to the characteristics of the bones of an adult. The skull at birth the child presented a large number of bones. Sagittal, coronal and occipital sutures open and start to close only 3 to 4 months of age. In term infants the lateral fontanel are usually closed. The posterior or small fontanel is located at the level of the occipital angles of the parietal bone, was opened in 25% of newborns and is closed not later than 4 - 8 weeks after birth. The front or large fontanel located at the junction of the coronal and longitudinal seams may be of different size. When measuring the distance between the midpoints of opposing edges they range from 3x3 cm to 1. 5x2 cm.

In the norm closure of large fontanel occurs to 1 - 11/2 years, but in recent years it is often observed to 9-10 months (Pic. 18).

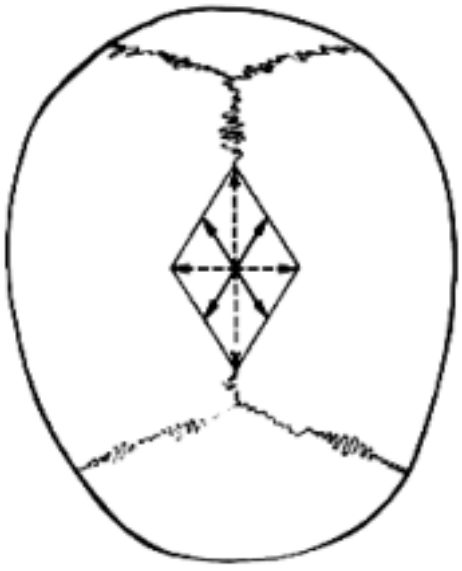


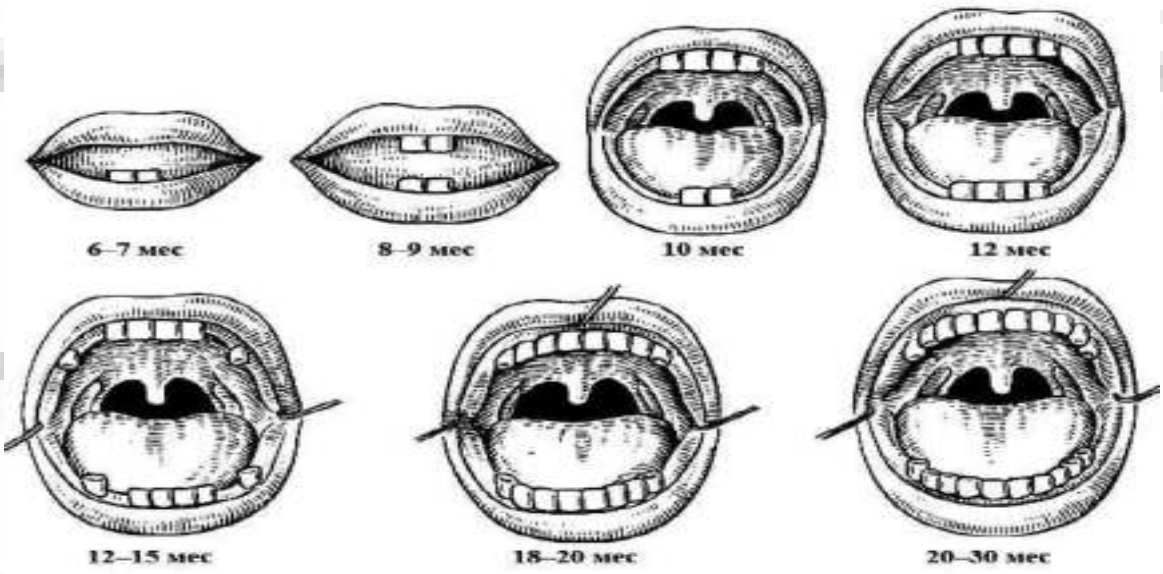
Fig. 18. Measurement of large fontanel. The solid line is correct, dotted – wrong.

The spine of the newborn is deprived of the physiological curves. The cervical curve begins to occur immediately after the holding of the head. The thoracic curve (kyphosis) is pre-installed after 6 - 7 months. life, when a child is independently sitting, and finally it is fixed only in 6 - 7 years. Lumbar lordosis becomes noticeable after 9-12 months, finally formed in the school years. In general throughout childhood fixation of the spine is imperfect, and influenced by poor muscle development, inadequate posture, without a corresponding increase child furniture appear quite easily change the shape of the spine (scoliosis and abnormal posture).

The newborn thorax is broad and short with the horizontally arranged ribs. Transverse diameter is more than average-longitudinal to 25%. Therefore, the rib cage, as if frozen in a position of maximum inspiration. Further, the growth of the thorax in length lowered front ends of the ribs, intensely increasing the transverse diameter. With 3 years becoming an effective costal breathing. To 12 years chest as he moves the form to the position of maximum exhalation. A particularly sharp increase in the transverse diameter of the thorax occurs by the age of 15.

Pelvic bones are relatively small in children of early age. The shape of the basin resembles a funnel. Bone growth of the pelvis is too intense to 6 years. From 6 to 12 years takes place relative stabilization of the size of the pelvis, and subsequently girls have the most intense development, in boys - moderate growth. The relative development of the pelvis can be assessed, comparing micromilieu distance (shoulder width) and microgastrinae distance (width of hips). If before puberty the ratio of the two diameters is equal to 1.3, after its start among the girls the ratio is reduced to 1.15, and in boys does not change or increases. Teeth made by double embryo: from the epithelium and underlying mesenchyme. From the epithelial tab it develop enamel and from the mesenchymal - dentin. The formation of teeth starts to the end of the second month of fetal development. After the formation of the dental lamina there are protrusions, which are formed of the enamel crown. First emerge, the enamel crowns of deciduous teeth (11 weeks), later permanent.

The milk teeth erupt after birth in a certain sequence (Pic. 19).



Pic. 19. The terms of eruption of primary teeth

Eponymous teeth on each half of the jaw erupt one temporarily. Lower teeth usually erupt before upper. The only exceptions are the lateral incisors - the upper teeth here appear before lower.

In dairy occlusion distinguish two periods. The first lasts from its formation up to 3 - 31/2 years. In this period, the teeth stand closely without gaps between them, imperceptible wear of the teeth, bite orthognathic due to insufficient growth and pulling forward the lower jaw. The second period (from 31/2 to 6 years) is characterized by the appearance of the physiological gaps between teeth (diastema or treme), significant wear of the teeth and a transition of orthognathic bite in a straight line.

The retention period of deciduous teeth and the permanent appearance is called the period of the mixed occlusion. With the change of milk teeth to permanent (replaceable bite) after the loss of a baby tooth until the eruption of permanent is usually 3 - 4 months. The first permanent teeth erupt about 5 years. They are usually the first molars. Then the sequence of emergence of permanent teeth is about the same as with deciduous. After the change of milk teeth to permanent at the age of about 11 years there are second molars. Third molars (wisdom teeth) erupt at age 17-25 years and sometimes later. In girls, the eruption of teeth occurs with some advance relative to boys (table 20).

Table 20. **The development of permanent formula of the dentition in children**

Age	Girls	Boys
6 years	6_____1___1_____6 6 1 1 6	6_____1___1_____6 6 1 1 6
7 years	6_____2112_____6 6 2112 6	6_____2112_____6 6 2112 6
8 years	6_____2112_____6 6 2112 6	6_____2112_____6 6 2112 6
9 years	654_____2112_____456 6 4321 1234 6	654_____2112_____456 6 4321 1234 6
10 years	654321_____123456 654321 123456	654321_____123456 654321 123456
11 years	7654321_____1234567 7654321 1234567	7654321_____1234567 7654321 1234567
12 years	7654321_____1234567 7654321 1234567	7654321_____1234567 7654321 1234567

For a rough estimation of permanent teeth regardless of gender, you can use the formula:

X (number of permanent teeth) = $4n - 20$, where n is the number of years of a child.

The formation of milk and permanent dentition in children is an important indicator of the level of biological maturation of the child. Therefore, in the evaluation of biological maturity of children used the term "dental age" (tab. 21). Of particular importance is the determination of the dental age in the assessment of

the degree of maturity of children of preschool and younger school age, where other criteria more difficult to use.

Table 21. **Assessment of the level of development of age in "dental age"**

Age	Gender	Number of teeth		
		slow development	average development	faster development
$5^{1/2}$ years	Boys	-	0 – 3	more 5 permanent teeth
	Girls	-	0 – 5	" 4 " "
	Boys	0	1 – 5	" 5 " "
	Girls	0	1 – 6	" 6 " "
$6^{1/2}$ years	Boys	0 – 2		" 8 " "
	Girls	0 – 2		" 9 " "
7 years	Boys	less than 5		" 10 " "
	Girls	" 6		" 11 " "
$7^{1/2}$ years	Boys	" 8		" 12 " "
	Girls	" 8		" 12 " "

9.1 Research method of bone systems and joints

Anamnesis. When the disease of the skeletal system to the main complaints presented by patients are it related to complaints of pain in the bones, joints, changes in their configuration, the limitation of mobility. Should clarify the localization of the pain (joints, tubular or flat bones), symmetrical lesions, the nature and intensity of pain (sharp, dull, aching), the conditions of its occurrence and duration (in movement, physical exertion, at rest, depending on meteorological conditions, frequency, constancy). It is advisable to identify the factors contributing to the reduction of pain (heat, rest, the use of certain medications). It is important to analyze forms of movement disorders. The latter can manifest as morning stiffness of joints, limitation of range of motion due to pain. Great importance for diagnosis is connected with the beginning of disease of the previous infections, among which sore throat, flu, exacerbation of chronic foci of infection occupy primary importance. To get an idea about the development of the skeletal system help information obtained in the collection of life history such as growth, age, closing fontanel, terms of teething.

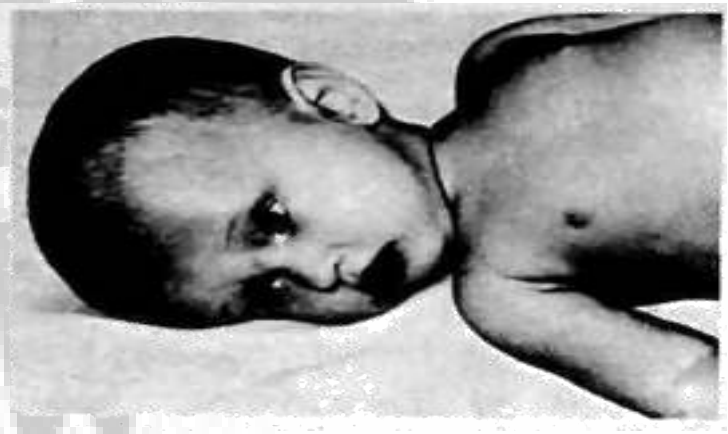
The examination is performed in the standing position at rest, lying down and in motion. Direction of the examination is from the top to bottom. Firstly, it is examined the head, then the torso (chest, spine), upper and lower limbs.

Head shape is normally round. With the proliferation of osteoid tissue protrusion of the frontal and parietal hillocks might be formed. In this case, the head gives the impression of a square (Pic. 20). If there given only the frontal bossing, talking about the "Olympic" forehead. Excessively developed parietal mounds with a depression between them may form natiform skull. Sometimes the large fontanel formed a impression that creates a saddle-shaped deformation of the head. Oblong, elongated upwards, the skull is called the tower. Most frequently deformation of the occipital bone is a flattening and skewness.

Pathological shape of the skull is usually developed as a result of suffering from rachitis, congenital syphilis, pathological bone fragility and other diseases. In newborn cranial deformation may be associated with birth trauma and expressed imbricate finding bones at each other, the impressions or protrusions in the result of subperiosteal hemorrhage (cephalhaematoma removed), brain herniation.

The head sizes are determined by measuring its circumference and comparing with age norms. The increase in head circumference (Cephalonia) can be associated with excessive proliferation of osteoid tissue, for example, with rickets or dropsy of the brain (Pic. 21). Small head (microcephaly) can occur in connection with intrauterine underdevelopment of the brain, or when premature fusion of cranial sutures (craniostenosis), developing the hypervitaminosis D.

Pic. 20 Change the shape of the head in rachitis (square head)



Pic. 21 Hydrocephalus

A required component examination and measurement of a head is a comparative evaluation of the upper and lower faces, as their ratio directly reflects the level of biological maturation of the child.

While in an examination of the facial part of the skull draws attention to the particular position of the upper and lower jaws, especially the bite, number of teeth and their condition. Bone deformation of the skull base leads to the retraction of the nose and the exophthalmia reduction of the transverse dimensions of the upper jaw with the formation of high Gothic palate. The front part of the upper jaw protrudes forward and the lower jaw when it is moved back, which is called prognathism. This position of the jaws subsequently leads to the formation of malocclusion.

During the examination of the teeth is necessary to determine their number on the upper and lower jaws, the ratio of milk and permanent teeth, their shape, direction of growth, integrity and color enamel. Roughly the number is meant the milk teeth can be calculated by the formula p - 4, where n -age of child in months. The mismatch of the timing of teething, usually a delay, most often associated with rickets. Premature eruption of the teeth or their presence since birth is much rarer and is not a diagnostic symptom of the disease. To anomalies of development of the teeth are supercompleteness (the appearance of extra teeth) congenital absence,

wrong direction of growth (teeth can be extended from the arch, rotated around its axis, substantially separated). The barrel-shaped deformity of the upper jaw incisors with lunate notch cutting edge (gatchinson incisors) are one of the signs of congenital syphilis.

Some diseases associated with impaired mineral and protein metabolism that the child suffered during the period of calcification of teeth may result in enamel hypoplasia. Teeth lose its natural Shine and covered with indentations of various sizes and shapes. The unusual color of the enamel (yellow, brown, pink, amber) may be due to a hereditary disease or a complication of drug therapy.

To the frequent diseases of the teeth include tooth decay, which have a significant effect on the health of the child.

During the examination of the chest especially appreciates its form. It pays attention to the deformity of the chest, the availability of chicken breast (in this case, the sternum protrudes forward in the form of a keel), peripneumonia sulcus Filatov - Harrison (retraction at the point of attachment of the diaphragm, in this case, the costal look as if turned forward), heart hump (protrusion of the chest in the heart area), chest, “shoemaker” or funnel chest (retraction of the sternum), etc.

It is necessary to pay attention to the amount of the epigastric angle. At the size you can roughly estimate the constitution of the child: with normosthenic constitution epigastric angle is 90°, with hypersthenic he was stupid, in asthenic acute. To determine the epigastric angle use the following method: the palm of both hands bluntly accordingly, the direction of the sides of the angle formed by the costal arches and the sternum.

During the examination of the spine should pay attention to whether there is curvature of the spine. Curvature of the spine is called lordosis, back of kyphosis (Pic. 22) in the direction of scoliosis (the latter is always a pathology). In the case of scoliosis during the child's examination in front or behind you may notice that one shoulder higher than the other and one arm adjacent to the torso (when hanging freely) is denser than the other and asymmetry of the location of the triangles waist (the waist triangles formed on each side inner line of the arm and waist).

Pic. 22 Congenital miopathy

During the inspection of the upper extremities pay attention to the relative length of the forearm and shoulder. Long-armed is characteristic of some congenital connective tissue diseases (Marfan's disease). It is often revealed the relative shortness of the forearms or hands. On fingers it is possible to see thickening or in the region of the phalangeal diaphysis bone that is characteristic of osteopathy, or directly around the small interphalangeal joints (the manifestation of rheumatoid arthritis).

During the examination of the lower extremities is necessary to pay attention to the symmetry of gluteal folds, number of folds on the inner surface of the thighs (especially in children first months of life), the shortening of the limb, X - shaped or O - shaped curvature of their feet.

Palpation of the head allows you to judge the density of the skull bones, the condition of the sutures and fontanel. The physician performing the palpation, puts her hands to the child's head so that your palms are on the temporal areas, and large fingers on his forehead. The index and middle fingers examined the parietal and occipital bones, and the sutures and fontanel. The bones of a child to the touch a dense, newborn somewhat malleable when pressed in the region of the edges of the fontanel and sutures. Pathological softening of bones can reveal it by pressing 4 fingers of both hands on the back of the head of the child. The softened scales of the occipital bone will bend like parchment (craniotabes). This symptom is characteristic of rickets. Bone defects can be in the region of the parietal hillocks and the sagittal suture. This variant of bone lesions is characteristic of xanthomatosis. In children the first year of life, special attention is paid to the study of the fontanel. By sensing the large fontanel, you first need to determine its size, which varies by perpendiculars drawn from side to side. Measuring the distance from corner to corner can't be right, as in this case, it is difficult to decide where ends and spring starts stitch. It should be carefully palpate the connective tissue membrane and the bony edge of the spring, defining, whether there is a bulging, retraction, ripple fontanel how smooth and crisp the edges, no excessive sasupensu and their compliance. Early closure of large fontanel may be a manifestation of pathologically rapid ossification and is seen in children with microcephaly. Late closure of the fontanel is usually found in rickets, hydrocephalus. An increase in intracranial pressure region recently closed fontanel can re-disperse. Because of the elasticity of the tissues covering the large fontanel, a healthy child, you may notice small fluctuations in its surface, synchronized breathing and heart rate, and a moderate protrusion at a voltage and cry. The gain ripple of the rill, as well as significant bulging indicates increased intracranial pressure, which may be associated with hydrocephalus or inflammation of the meninges (meningitis). With a very strong tension spring stops its pulsation. The retraction of the fontanel is usually associated with loss of large amounts of fluid (exsicosis).

Palpation of the ribs in healthy children there is a barely noticeable bulge in the region of transition of bone part of them in the cartilage. Palpation is performed with the fingertips in the course of the ribs from the anterior axillary line to the sternum. Palpation reveals a greater hemispherical bulge in the region of transition

of bone part of rib in cartilaginous. Symmetrically on both sides of the sternum, these bulges create the impression of a number of beads. They are called rachitic “rosary”.

Palpation of the bones of the extremities should monitor the child's behavior, as in certain diseases of the palpation of the bones is painful. Can be detected and various deformities, and thickening of the bones, detectable only by palpation. You can define a bulge in the region of the epiphyses of the radius (bracelet). Because, children of all ages there are some thickening of the epiphysis of the radial bone, palpation is best done with slightly bent arm to the wrist joint. In the presence of bracelet it felt cylinder form bloating. Palpation can also detect thickening in the region of the diaphysis of the phalanges (with pearls).

Examination of the joints is usually done simultaneously with the study of bone and muscular system with the help of inspection, palpation and measurement. During the inspection it turns out the shape of the joints, the presence of deformations. It follows to pay attention to the color of the skin in region of joints, it changes. The size of the joints is measured with measuring tape at the same level. Measurement of range of motion (goniometer) is preferable of both passive and an active as well.

Then proceed to palpation of the joints. It is advisable to start gently palpation (especially in the presence of pain), determining the temperature sensitivity, thickness and mobility of the skin over the joints, the presence of a thickening, swelling, precise localization of painful points. It is important to establish the presence of effusion in the joint cavity or in the inversions of the bag by the method of fluctuations and a symptom of “floating patella”. To explore the joint by fluctuations is better in a bent position of the limb. With the effusion jerky pressing one side of the joint is felt on the opposite side by the transfer of the wave of fluid. The symptom of "floating patella" is more accurate. It is held as follows: compress the knee joint is straightened with palms on both sides and slightly shift the periarticular soft tissue up at the same time making jerky pressure with your fingers on the patella. In case of effusion patellar it flows freely in the liquid.

X-ray examination of the bones carried out for various reasons. Chief among them is suspected of inflammatory-destructive lesions of the bones (osteomyelitis) or tumors of the skeletal system. Under the control radiographic data, treatment of bone fractures. Often x-ray data are used for diagnostics of bone age in endocrine diseases or in studying the structure of bone tissue in diseases of metabolism. The decrease of density of bone structure (osteoporosis) especially observed in early childhood when the balance of calcium and phosphorus (rickets), but could be a consequence of endocrine and metabolic diseases in older children. Focal rarefaction of bone observed in primary hyperparathyroidism, a common osteoporosis - by increasing the activity of the adrenal glands or the treatment of glucocorticoid row.

For the diagnosis of diseases of the skeletal system turns to laboratory data, in particular biochemical, research. In metabolic bone disease investigated the levels of calcium and phosphorus in the blood serum and their excretion in the urine. The

activity of remodeling and resorption of bone tissue reflects the level of alkaline phosphatase in serum, and determination of the levels of hydroxyproline in blood and urine.

9.2 Pathological condition of bone tissue in children

Defeat of bone system in children can be congenital and acquired. From the congenital anomalies most frequently observed congenital dislocation of the hip, and various malformations of individual parts of the skeleton. In second place are congenital dysplasia of the skeleton, in which there are anomalies in the formation of the tissues themselves musculoskeletal. They are divided into chondro and osteodysplasia and manifested in various deformities of the skeleton, encountered in the process of child's growth (Pic. 23).

Acquired bone disease at an early age is mainly represented by rickets. Rickets is a metabolic disease, which occurs in a variety of adverse effects on the child's body, including disturbances of balance of calcium, phosphorus and vitamin D. Clinically the syndrome of rickets is represented as primarily changes of the skeletal system. They are based on a softening of bones and hyperplasia of osteoid tissue. An early sign of softening (osteomalacia) is the appearance of pliability of the bones forming region of the large fontanel. Later, areas of softening appear in the area of small fontanel and sagittal suture, and further it becomes soft all the scales of the occipital bone (craniotabes). This can cause increased growth of head circumference - rachitic hydrocephalus. Osteomalacia chest is manifested by the formation of impressions of the navicular on the lateral surfaces and other deformities, osteomalacia of the spine - kyphosis in the lower thoracic and upper lumbar vertebrae. When walking kyphosis it will be change to lordosis. The long bones are bent, curved, humerus, and forearm - arc convex outwards, feet - shaped or X-shaped.

Complex osteoid hyperplasia manifests itself by the formation of hillocks of the frontal, parietal mounds, “bracelet” and "rosary." The blood thus detected by the elevated levels of alkaline phosphatase, a decrease in the level of phosphorus, at least - hypocalcemia.

Osteomalacia with bone deformities can occur in children older than one year. In such cases, carry out differential diagnostics of various diseases rickets associated with lack of utilization of calcium from the intestine or excessive loss of calcium and phosphorus in the urine. The basis of such diseases, sometimes called late rickets are congenital disorders of the metabolism of vitamin D (the inability to the formation of its active derivatives) or congenital inferiority of the tubular apparatus of the kidney (insufficiency of tubular reabsorption of phosphate). Then make a diagnosis with renal rachitis.

Among the acquired diseases of bone osteomyelitis is frequent that begin high rise of temperature, deterioration of General condition of the child and only a few days - pain in the bones with limitation of movement. Around the affected area of bone formed soft tissue swelling, redness of the skin and other symptoms of acute purulent inflammation.

In children of school age (10-14 years) recorded the highest frequency of traumatic lesions of bone tissue - bone fractures. To occur in children and bone tumors, the incidence of which increases in those age periods when there is most intense traction.

Joint diseases are often congenital in nature. Most often affects the knee joints. The reason for their defeat can be injury (traumatic arthritis), infections (infectious arthritis). In arthritis it is getting pain in the joint and limited mobility and deformity of the joint due to the accumulation of fluid in the cavity and articular capsule. Often, the arthritis is accompanied by joint reaction of the surrounding soft tissues. For traumatic and infectious arthritis often favorable, however, if the purulent arthritis, it is severe. Finally, children have rheumatic arthritis and arthritis as a manifestation of systemic diseases of connective tissue (Pic. 24).

Pic. 23. Chondrodystrophy

Pic. 24. Rheumatoid arthritis

APPENDIX

1. Scheme of the anamnesis and objective examination of the patient

A. History of disease

1. Complaints on admission and during follow-up (the story of the patient or the parents).

2. When was a child sick?

3. Under what circumstances was the disease developing and how was it elapsing from the first day until the examination?

4. Common symptoms of the disease (fever, chills, sleep, appetite, thirst, lethargy, restlessness, mood, etc.) - to reflect the dynamics.

5. Manifestations of the disease on the part of all the systems and organs:

a) respiratory system: cough, dry or wet, the time of its occurrence (morning, afternoon, at night, during sleep), character. Sputum (amount, character and color, how the child coughs). Pain in the chest or back (character, localization, relation with the breath, cough, irradiation). Shortness of breath (inspiratory or expiratory), when it is manifested (at rest, during exercise, etc.), the presence of attacks of breathlessness (participation of accessory muscles, nasal flaring);

b) cardiovascular system: shortness of breathing (see above). Pain in the heart area (localization, irradiation, character). The feeling of "disruption" of heartbeats (intensity, duration, frequency). Edema (location, time of occurrence);

c) digestive system: nausea (its relationship with food nature, duration). Vomiting (while fasting, after eating, in postprandial interval, nature). Regurgitation of infants (abundant, small, immediately after a meal or between feedings). The presence of heartburn or regurgitation. Abdominal pain (nature, localization, irradiation, time of occurrence and the connection with food intake). Stool (frequency, nature, color, smell);

d) urinary system: pain in the lumbar region. The frequency of urination, and their volume (in infants - the number of wet diapers). The color of urine. Night involuntary urination;

e) the musculoskeletal system: pain in the limbs, muscles, joints (nature, location, connection with the meteorological conditions). Joint swelling, redness of them (which ones). The crux of the motion, morning stiffness;

f) the endocrine system: violation of hair. Skin changes (excessive sweating or dryness, roughness, scarring). Violation of height and weight;

g) the nervous system and sensory organs: headache and dizziness. Cramps, hyperkinesis, tics, infringement of skin sensitivity (hyperesthesia, hypoesthesia, paresthesia). Violation of the senses and speech.

6. Previous treatment carried out prior to admission to the hospital and its results, the presence of drug reactions.

The conclusion from the general anamnesis: the assumption of being damaged of certain systems and organs.

B. Anamnesis of early age children (under 3 years)

1. From what pregnancy and the number of the child in a row; if the pregnancy is not the first, how was the previous one?

2. How was the pregnancy of the mother (toxemia of the first, the second half of pregnancy - nausea, vomiting, edema, hypertension, nephropathy, eclampsia)?

3. Mode and feeding habits of the pregnant. Was the maternity leave used?

4. How were the labors (duration, benefits, complications)?

5. Did the child cry immediately? How was the scream (loud or weak)?

6. Body weight and height at birth.

7. When putting him to the breast how the baby received it, in how many hours the child was put to the breast (the number of nursing hours)?

8. When did umbilical cord drop and was the wound healed?

9. Was there a physiological birth weight loss of the mother and when she recovered?

10. Diseases in the newborn period (the intensity and duration of jaundice - group and Rh incompatibility of mother and child, birth trauma, diseases of the skin and the navel, respiratory and digestive system, septic diseases, and others.).

11. On which day and at what weight body was the child discharged?

12. The physical development of the child: weight gain and height in the first year of life (by months), and after a year.

13. The development of statics and motoric skills: when he began to hold his head, to turn over on his side, his back to his stomach when he began to sit, crawl, stand, walk, run?

14. Mental development: when he began to smile, cooing, recognizing mother, pronounce certain syllables, words, phrases; vocabulary by 1 year and 2 years.

15. The behavior of the child at home and in the team.

16. Sleep, its characteristics and duration.

17. How the child is feed - natural, artificial, mixed. When breastfeeding - breastfeeding duration, sucking activity, feeding of one or both breasts, pumping after feeding. When mixed feeding – how the child finishes eating, starting from what age, the amount and method of introduction of supplementary feeding. What are the measures to combat hypogalactia of the mother? When artificial feeding - at what age and what the child was feed with, how much and in what sequence? What is the interval between feedings, regular or erratic feeding, was night break maintained? Were there any juices (kinds), vitamin D, fish oil - at what age, in what quantity? When he started receiving complementary foods, the amount, the sequence of administration, tolerability? Time of weaning. Features of taste and appetite. Child's nutrition to the top of this disease.

18. When did the teeth erupt and the procedure for eruption?

19. Experienced diseases (when and what kind), including infectious and surgical intervention. The course of the disease, complications.

20. Vaccinations: against tuberculosis (BCG), polio, whooping cough, diphtheria, tetanus and measles. Reactions to vaccinations.

21. TB tests that were carried out and their results.
22. Contact with infectious patients.

C. Anamnesis of older children

1. What is the number of the child in a row?
2. How did he develop in early childhood?
3. The behavior at home and in public, for students - school performance, what subjects does he prefer?
4. Experienced medical and surgical interventions.
5. Vaccinations.
6. Tuberculin tests, when carried out, their results.
7. Contact with infectious patients.

D. Family anamnesis

1. The age of the parents.
2. Health status of parents and next of kin of the mother and father (tuberculosis, syphilis, toxoplasmosis, alcoholism, mental, nervous, endocrine and allergic diseases).
3. Status of the genealogical tree within three generations, beginning with the sick child to the grandparents and vertical to the brothers and sisters across.
4. How many children are there in the family and the state of their health; if anyone died, then by what reasons? The obtained data are recorded in the genetic map.

E. Material and living conditions

1. Where do the parents work, their profession, the total income, number of family members?
2. The family lives in what kind of apartment: area, dry, light, warm, ventilated properly? The number of children and adults living there?
3. Does the child attend the child care facilities?
4. Who takes care of the child, the health condition of a person caring for a child?
5. Does the child have a private bed?
6. How often is the child bathed? Is he provided with garment, toys?
7. Are there clothing appropriate for a season?
8. Is the day routine obeyed, what is the duration of walks and sleep? Nutrition mode, the load at school. Schoolchildren - schedule, the availability of additional loads.

The overall conclusion according to anamnesis: the damage of a system can be assumed, acute or chronic disease, what are the negative factors of the anamnesis of life or family-living conditions anamnesis that could contribute to the development of the disease or to worsen it?

F. An objective study

1. The condition of the patient (satisfactory, moderate, severe, very severe) and well-being.

2. The position in bed (active, passive, involuntary).

3. The patient's consciousness (clear, darkened, absent). In the absence of consciousness, to assess the degree of coma.

4. Nervous system: mood (smooth, quiet, good), sleep and appetite. Contact with others children and adults, the interest in toys.

Reflexes and neonatal symptoms: cervical-tonic, hand-mouth, Moro reflex, reflexes of Robinson, Babinski, crawling on Bauer.

The width of the palpebral fissure, strabismus, nystagmus, visual and auditory concentration. The size of the pupils, their reaction to light. Motoric and mental function at the time of the survey (sitting, standing, crawling, walking, speech).

Meningeal syndrome: a stiff neck, Kernig and Brudzinsky symptoms (top, bottom, pubic), in infants - a bulging fontanelle.

5. The condition of the skin and visible mucous membranes: color, rashes, bleeding, scars, hair and nails, exfoliation, skin moisture, skinfold thickness, its elasticity.

Endothelial samples: bandage, pinch, hammer signs. Determining the type of dermographism (red, white, mixed), the speed of its appearance and disappearance.

6. The subcutaneous fat layer: uniform distribution, thickness of subcutaneous fat folds in some areas of the body: abdomen, chest, back, upper and lower extremities, face. The presence of seals and swelling, their location and extent. Tissue turgor.

7. Status of the musculoskeletal system: the definition of tone and muscle strength.

8. State of the skeletal system: determination of the size and shape of the head, craniotabes, large fontanelle (its size, the state of the edges of the bone and soft tissue, protrusion, retraction), the condition of the skull sutures. Shape of the chest, rachitic rosary, Harrison's culcus, bracelets, pearl strands, curvature of the spine (kyphosis, lordosis, scoliosis), and limbs (O-shaped, X-shaped, saber), flat feet. The shape, size, mobility of joints (shoulder, elbow, wrist, hip, knee, ankle, small joints of the hands and feet).

9. The lymphatic system: the value, quantity, consistency, mobility, sensitivity of the lymph nodes - the occipital, parotid, submandibular, genial, cervical (front and rear), over-and subclavian, thoracic, retromuscular, cubital, inguinal.

10. Anthropometry and indexes: definition of body weight, height, head circumference, chest, shoulder, thigh, shin, the height of the head, the middle point of the length of the body, the Philippine test, Erismann index; for children under 3 years - Chulitskaya indices (nutritional status and proportionality).

Conclusion according to the physical development and indices of the child.

11. Respiratory system: voice, cry, cough, phlegm. Nose or mouth breathing. Type of breathing, the number of breaths per minute, pulse breath ratio, depth of

breathing, rhythm (Cheyne Stokes, Biot's, Kussmaul's respiration). The presence and typre of breath shortness (inspiratory, expiratory, mixed). The symmetry of the thorax. Symptoms of skin fold thickening, elastic skin resistance.

Voice tremor. Comparative and topographic lung percussion. Mobility of pulmonary edges. Auscultation of the lungs: the definition of the nature of breathing (puerile, tough, vesicular, bronchial), its sonority (strong, weak, etc.), bronchophony.

Rattling - dry (buzzing and whistling), moist (medium and small bubbling), location, quantity, sonority, conductivity. Pleural friction.

12. Cardiovascular system: an external examination. Pulsation of the carotid arteries, the swelling and pulsating of the neck veins, pulsation of the heart area and epigastric. Apical impulse, its location, the power, the prevalence. The bruissement (systolic and presystolic jitter). Pulse of the radial artery, its characteristics (synchrony, frequency per minute, filling, voltage, rhythm).

The borders of the relative and absolute cardiac dullness. Auscultation of the heart: heart tones, their clarity, speed, presence of accents, splitting or bifurcation of II, or III tones, rhythm. Characteristics of systolic or diastolic noise - quality, intensity, best place for listening, duration, conductivity, dependence on the change of position, the load (individual load). Graphical representation of tones and cardiac murmurs. Determination of blood pressure - the maximum and minimum. Functional cardiac tests (Stange - Ghencea, Shalkov) - an individual load. ECG and PCG – record graphically.

13. Gastrointestinal tract: the state of the oral mucosa, pharynx, tonsils, tongue - color, humidity, air raids, the follicles, the crack, the state of papillae. Condition of the teeth– baby teeth, constant, number, presence of caries.

The shape and size of stomach (circumference in centimeters, compared to the circumference of the chest), varicose veins of the anterior abdominal wall, visible peristalsis, the difference of direct abdominal muscles, condition of a navel. Percussion of the abdomen, the definition of ascites and pseudo- ascites, symptom of balloting or undulation, determination of liver size. Percussion of the spleen, the definition of its longitudinal dimension. Superficial palpation of the abdomen (muscle tension of anterior abdominal wall, tenderness, local indurations).

Deep palpation of the abdomen, palpation of the liver (the outpouching of the costal arch, characteristic of the liver edge, texture, tenderness).

Palpation of the small and large bowels, mesenteric nodes.

Auscultation of the stomach (peristalsis). Status of the anus (cracks, dehiscence), prolapse of the rectum. Stool and its character (color, smell, consistency, pathological impurities).

Urinary system: inspection of the lumbar region, bimanual palpation of the kidneys, palpation and percussion of the bladder. Painful points: edge-vertebral, upper and middle ureteral. Symptom of Pasternatsky (costovertebral angle tenderness). The frequency of urination, pain, urinary incontinence. Diuresis, the ratio of daytime and night urination. The data on inspection of the external genitalia.

14. The endocrine system: violation of height growth (gigantism, dwarfism) and body mass (abrosia, obesity), distribution of subcutaneous fat layer. Status of the thyroid gland (the value of the lobes and the isthmus). Genital organs, secondary sexual characteristics, the degree of their intensity.

15. Clinical tests (blood, urine, fecal matter, duodenal and gastric contents). Biochemical blood tests.

Data of X-rays.

Evaluation and comparison of the data analysis with the norms.

Conclusion on all analyzes, evaluation of abnormalities.

17. The final diagnostic summary.

The general conclusion on the anamnesis and status (presumptive diagnosis of lesions). Justification for primary lesion based on diagnosis of the anamnesis, objective examination, laboratory, instrumental and radiological data.

18. Justification for nutrition. Drawing up the menu. Calculation of food ingredients and calorie on the daily diet and per 1 kg of body weight. The ratio of proteins, fats and carbohydrates.

After recording status praesens and tentative conclusion on a daily basis information about changing the condition of the patient, the dynamics of the pathological process is recorded in the anamnesis of the patient for ground prescribed designated examination and treatment. In subsequent daily records should be reflected the dynamics of the state of health of the child (clinical data, laboratory tests).

Furthermore, clinical course of disease, and treatment and performed examinations should be displayed graphically on a nursing note.

At the end of the anamnesis, after termination of treatment and observation of the child in the clinic, conclusion, or epicrisis should be written, where there are features of the disease, the examination data and the results of treatment, as well as the recommendations for further monitoring of the child in the polyclinic.

2. Indicators of physical development of children

The body length (cm) distribution regarding to age (boys).

Age	Centile					
	3	10	25	75	90	97
0 mon.	48,0	48,9	50,0	53,2	54,3	55,1
1 »	50,5	51,5	52,8	56,3	57,5	58,7
2 »	53,4	54,3	55,8	59,5	61,0	62,1
3 »	56,1	57,0	58,6	62,4	64,0	65,5
4 »	58,6	59,5	61,3	65,6	67,0	68,7
5 »	61,0	61,9	63,4	67,9	69,6	70,9
6 »	63,0	64,0	65,6	69,9	71,3	72,5
7 »	65,0	65,9	67,5	71,4	73,0	74,1
8 »	66,5	67,6	68,9	73,0	74,5	75,7
9 »	67,8	68,8	70,1	74,5	75,9	77,1

10 »	68,8	69,9	71,3	76,1	77,4	78,8
11 »	69,9	71,0	72,6	77,3	78,9	80,4
12 »	71,0	72,0	73,8	78,5	80,3	81,7
15 »	72,9	74,3	76,0	81,3	86,5	84,9
18 »	75,0	76,5	78,4	84,4	83,4	88,2
21 »	77,2	78,6	80,8	86,8	88,2	91,0
24 »	79,4	81,0	83,0	88,4	92,0	93,8
27 »	81,4	83,2	85,5	92,2	94,6	96,3
30 »	83,7	85,2	87,5	94,8	97,2	99,0
33 »	86,0	87,4	90,0	97,4	99,7	101,4
36 »	88,0	89,6	92,1	99,7	102,2	103,9
3 $^1/_2$ y.o.	90,3	92,1	95,0	102,5	105,0	106,8
4 y.o.	93,2	95,4	98,3	105,5	108,0	110,0
4 $^1/_2$ »	96,3	98,3	101,2	108,5	111,2	113,5
5 y.o.	98,4	101,7	105,9	112,0	114,5	117,2
5$^1/_2$ »	102,4	104,7	108,0	115,2	118,0	120,1
6 »	105,5	108,0	110,8	118,8	121,4	123,3
6$^1/_2$ »	108,6	110,9	113,9	122,0	124,4	126,4
7 »	110,3	113,8	117,0	125,0	127,9	130,0
8 »	116,4	118,8	122,0	131,0	134,3	136,4
9 »	121,5	124,6	127,5	136,5	140,3	142,5
10 »	126,4	129,2	133,0	142,0	146,2	149,1
11 »	131,2	134,0	138,0	148,3	152,9	155,2
12 »	135,8	138,8	142,7	154,9	159,5	162,4
13 »	140,2	143,6	147,4	160,4	165,8	169,6
14 »	144,9	148,3	152,4	166,4	172,2	176,0
15 »	149,3	153,2	158,0	172,0	178,0	181,0
16 »	154,0	158,0	162,2	177,4	182,0	185,0
17 »	159,3	163,0	168,1	181,2	185,1	187,9

The body length (cm) distribution regarding to age (girls).

Age	Centile					
	3	10	25	75	90	97
0 mon.	47,0	48,0	49,2	52,1	53,3	54,5
1 »	49,7	50,7	52,4	55,3	56,9	57,7
2 »	52,2	53,3	55,0	58,6	59,9	60,8
3 »	55,1	56,1	57,9	61,5	63,0	63,9
4 »	57,4	58,6	60,5	64,1	65,6	66,4
5 »	59,9	61,0	62,8	66,4	67,8	68,8
6 »	62,1	63,0	64,3	68,2	69,8	70,8
7 »	63,7	64,2	66,4	70,0	71,6	72,7
8 »	65,2	66,1	67,7	71,6	73,1	75,2
9 »	66,5	67,5	69,3	72,8	74,5	75,8
10 »	68,8	68,8	70,5	74,2	75,9	77,1
11 »	67,7	70,3	71,7	75,7	77,1	78,3
12 »	69,0	71,4	72,8	78,8	78,3	79,3
15 »	70,3	73,6	75,2	82,1	81,2	82,4
18 »	72,2	75,8	77,5	84,6	84,4	86,0
21 »	74,0	78,2	80,0	87,5	87,4	88,8

24 »	76,0	80,4	82,6	90,1	90,2	92,2
27 »	78,4	83,0	85,4	92,8	93,0	94,7
30 »	80,8	85,6	87,8	95,5	95,6	97,3
33 »	83,4	88,2	90,3	98,1	98,2	100,0
36 »	85,9	90,8	92,9	101,0	100,8	102,9
3 $^1/_2$ y.o.	88,6	93,4	95,6	104,2	103,9	105,8
4 y.o	91,0	96,2	98,4	107,1	106,9	109,1
4 $^1/_2$ »	94,0	99,3	101,5	110,7	110,6	114,0
5 y.o	96,9	102,4	104,9	114,5	114,0	116,5
5$^1/_2$ »	99,9	105,2	108,0	118,0	117,1	120,0
6 »	102,5	108,0	111,0	121,7	120,8	124,0
6$^1/_2$ »	105,3	110,5	114,0	125,0	124,4	127,4
7 »	108,0	113,6	117,1	125,0	128,1	131,3
8 »	111,0	119,4	123,0	131,0	134,4	137,6
9 »	116,6	124,4	128,5	136,7	140,6	143,8
10 »	122,0	130,0	133,8	142,5	146,6	150,1
11 »	127,0	134,2	138,6	148,6	153,9	156,8
12 »	131,0	138,4	143,0	155,1	159,3	163,5
13 »	135,2	143,1	148,0	160,3	164,3	168,0
14 »	139,5	147,4	152,4	164,2	168,0	170,5
15 »	144,0	151,6	156,3	167,0	170,3	172,6
16 »	148,1	155,0	158,3	169,0	172,0	174,1
17 »	154,2	157,3	161,2	170,0	173,1	175,5

The distribution of body weight (kg) by age (boys).

Age	Centile					
	3	10	25	75	90	97
0 mon.	2,4	2,7	3,0	3,7	4,0	4,4
1 »	3,1	3,5	3,8	4,5	5, 2	5,6
2 »	3,9	4,3	4,6	5,5	6,2	6,6
3 »	4,5	4,9	5,4	6,4	7,0	7,5
4 »	5,2	5,6	6,2	7,2	7,9	8,4
5 »	5,8	6,2	6,8	7,9	8,6	9,1
6 »	6,4	6,8	7,4	8,6	9,2	9,7
7 »	6,9	7,4	7,9	9,1	9,8	10,3
8 »	7,4	7,8	8,4	9,6	10,3	10,8
9 »	7,8	8,3	8,9	10,1	10,9	11,3
10 »	8,0	8,6	9,2	10,6	11,3	11,8
11 »	8,3	8,9	9,5	11,0	11,8	12,3
12 »	8,6	9,1	9,8	11,5	12,2	12,7
15 »	9,2	9,6	10,5	12,2	12,9	13,5
18 »	9,6	10,2	11,0	12,8	13,6	14,2
21 »	10,1	10,6	11,5	13,5	14,3	14,9
24 »	10,6	11,1	12,0	14,1	14,9	15,4
27 »	11,1	11,6	12,4	14,6	15,4	15,9
30 »	11,5	12,0	12,8	15,1	16,0	16,5
33 »	11,9	12,4	13,2	15,6	16,5	17,0

6 »	6,4	6,8	7,4	8,6	9,2	9,7
7 »	6,9	7,4	7,9	9,1	9,8	10,3
8 »	7,4	7,8	8,4	9,6	10,3	10,8
9 »	7,8	8,3	8,9	10,1	10,9	11,3
10 »	8,0	8,6	9,2	10,6	11,3	11,8
11 »	8,3	8,9	9,5	11,0	11,8	12,3
12 »	8,6	9,1	9,8	11,5	12,2	12,7
15 »	9,2	9,6	10,5	12,2	12,9	13,5
18 »	9,6	10,2	11,0	12,8	13,6	14,2
21 »	10,1	10,6	11,5	13,5	14,3	14,9
24 »	10,6	11,1	12,0	14,1	14,9	15,4
27 »	11,1	11,6	12,4	14,6	15,4	15,9
30 »	11,5	12,0	12,8	15,1	16,0	16,5
33 »	11,9	12,4	13,2	15,6	16,5	17,0
36 »	12,1	12,8	13,6	16,0	16,9	17,5
3 $^1/_2$ y.o.	12,7	13,4	14,2	17,0	18,0	18,7
4 y.o.	13,3	14,2	15,1	18,0	19,1	20,0
4 $^1/_2$ »	14,0	14,9	15,9	19,0	20,6	21,7
5 y.o.	14,8	15,7	16,8	20,1	22,0	23,2
5$^1/_2$ »	15,5	16,6	17,8	21,4	23,4	25,1
6 »	16,3	17,6	18,9	22,6	24,9	27,0
6$^1/_2$ »	17,2	18,4	20,0	24,0	26,4	29,0
7 »	18,2	19,6	21,3	25,5	28,0	31,1
8 »	20,0	21,5	23,4	28,4	31,7	35,1
9 »	22,0	23,4	25,6	31,4	35,4	39,2
10 »	24,0	25,6	28,0	35,1	39,5	45,0
11 »	26,0	28,0	31,0	39,2	44,5	50,5
12 »	28,3	30,4	34,4	43,8	50,0	57,0
13 »	31,0	33,4	39,8	49,0	56,2	63,6
14 »	34,0	35,2	42,3	54,6	62,2	70,6
15 »	37,8	40,8	46,9	60,2	65,1	76,5
16 »	41,2	45,4	51,8	65,9	73,0	82,5
17 »	46,4	50,5	56,8	70,6	78,0	86,2

The distribution of body weight (kg) by age (girls).

Age	Centile					
	3	10	25	75	90	97
0 mon.	2,3	2,6	3,0	3,5	3,8	4,0
1 »	3,0	3,3	3,7	4,3	4,6	4,9
2 »	3,7	4,0	4,4	5,0	5,3	5,6
3 »	4,4	4,6	5,0	5,7	6,1	6,5
4 »	5,0	5,3	5,6	6,5	6,9	7,4
5 »	5,5	5,8	6,2	7,2	7,7	8,2
6 »	6,1	6,3	6,8	7,9	8,5	9,0
7 »	6,5	6,8	7,3	8,5	9,1	9,7
8 »	7,0	7,3	7,7	9,1	9,7	10,5
9 »	7,4	7,7	8,2	9,6	10,4	11,2
10 »	7,7	8,1	8,7	10,1	11,0	11,3
11 »	8,1	8,5	9,1	10,6	11,5	12,2

12 »	8,3	8,8	9,4	11,0	11,9	12,6
15 »	8,9	9,4	10,0	11,7	12,7	13,3
18 »	9,4	9,9	10,6	12,5	13,4	13,9
21 »	9,8	10,4	11,1	13,1	13,9	14,6
24 »	10,3	10,9	11,6	13,5	14,5	15,2
27 »	10,8	11,3	12,0	14,0	15,0	15,7
30 »	11,2	11,7	12,5	14,5	15,5	16,3
33 »	11,5	12,1	12,9	14,9	16,0	16,8
36 »	11,8	12,5	13,3	15,4	16,5	17,3
3 1/2 y.o.	12,4	13,1	14,0	16,3	17,8	18,6
4 y.o.	13,1	13,9	14,8	17,2	19,0	20,0
4 1/2 »	13,8	14,9	15,8	18,4	20,4	21,6
5 y.o.	14,9	15,8	16,9	19,8	21,9	23,7
5 1/2 »	15,6	16,6	17,8	21,2	23,6	25,8
6 »	16,3	17,4	18,8	22,5	25,1	27,9
6 1/2 »	17,1	18,2	19,9	24,0	26,7	29,8
7 »	18,0	19,3	20,8	25,3	28,4	31,8
8 »	20,0	21,2	23,0	28,5	32,2	36,4
9 »	21,9	23,3	25,4	32,0	36,4	41,0
10 »	23,9	25,6	28,0	36,0	41,1	47,0
11 »	26,0	28,0	31,1	40,3	46,0	53,5
12 »	28,4	31,4	35,2	45,4	51,3	58,8
13 »	32,0	35,3	40,0	51,8	56,8	64,2
14 »	36,1	39,9	44,0	55,0	60,9	70,0
15 »	39,4	43,7	47,6	58,0	63,9	73,6
16 »	42,4	46,8	51,0	61,0	66,2	76,1
17 »	45,2	48,4	52,4	62,0	68,0	79,0

Distribution of head circumference (cm) by age (boys).

	Centile					
Age	3	10	25	75	90	97
0 mon.	32,5	33,2	34,0	35,5	36,5	37,7
1 »	34,8	35,3	36,0	37,9	39,0	39,8
2 »	36,9	37,3	38,0	40,3	40,9	41,8
3 »	38,4	38,8	39,5	41,6	42,5	43,3
4 »	39,6	40,2	40,0	42,9	43,8	44,5
5 »	40,6	41,2	42,0	44,0	45,0	45,9
6 »	41,5	42,0	42,7	45,3	46,0	46,7
7 »	42,2	42,8	43,7	46,1	47,0	47,7
8 »	42,8	43,6	44,2	46,8	47,7	48,4
9 »	43,5	44,0	44,8	47,4	48,3	49,0
10 »	44,0	44,6	45,4	48,0	48,8	49,6
11 »	44,3	45,0	45,9	48,6	49,3	50,0
12 »	44,6	45,3	46,2	49,1	49,8	50,7
15 »	45,3	46,0	46,7	49,5	50,3	51,3
18 »	46,0	46,6	47,3	49,9	50,7	51,6
21 »	46,5	47,2	47,7	50,3	51,0	52,0
24 »	47,0	47,6	48,1	50,5	51,3	52,3
27 »	47,3	47,9	48,5	50,8	51,7	52,7

30 »	47,5	48,2	48,8	51,1	52,0	53,0
33 »	47,8	48,4	49,2	51,3	52,3	53,3
36 »	48,0	48,6	49,5	51,5	52,6	53,5
3 1/2 y.o.	48,6	49,2	49,9	52,0	53,0	54,0
4 y.o.	49,0	49,6	50,2	52,4	53,4	54,3
4 1/2 »	49,3	49,8	50,4	52,7	53,8	54,6
5 y.o.	49,6	50,1	50,7	53,1	54,2	55,0
5 1/2 »	49,8	50,4	51,0	53,5	54,5	55,5
6 »	50,0	50,6	51,2	54,0	54,8	55,7
6 1/2 »	50,2	50,8	51,4	54,3	55,0	55,8
7 »	50,4	51,0	51,6	54,5	55,3	56,0
8 »	50,5	51,4	52,0	55,0	55,8	56,6
9 »	50,8	51,7	52,5	55,5	56,3	57,2
10 »	51,2	52,0	52,8	56,0	56,7	57,7
11 »	51,5	52,3	53,2	56,3	57,2	58,2
12 »	51,7	52,6	53,5	56,7	57,7	58,8
15 »	51,9	52,8	53,7	57,3	58,1	59,2
18 »	52,1	53,0	54,0	57,5	58,5	59,6
21 »	52,3	53,2	54,3	57,8	58,8	60,0
24 »	52,4	53,4	54,4	57,9	59,0	60,1
17 »	52,5	53,5	54,6	58,1	59,1	60,2

Distribution of head circumference (cm) by age (girls).

	Centile					
Age	3	10	25	75	90	97
0 mon.	32,0	33,0	34,0	35,5	36,4	37,0
1 »	33,8	34,8	36,0	38,0	38,8	39,5
2 »	35,6	36,3	37,4	39,8	40,6	41,4
3 »	36,9	37,7	38,5	41,3	42,2	43,0
4 »	38,2	38,9	39,7	42,4	43,3	44,2
5 »	39,2	39,9	40,7	43,5	44,4	45,4
6 »	40,1	40,8	41,5	44,3	45,3	46,3
7 »	41,0	41,7	42,5	45,3	46,2	47,3
8 »	41,6	42,3	43,2	45,9	46,9	48,0
9 »	42,4	42,9	43,7	46,6	47,6	48,5
10 »	42,8	43,5	44,3	47,2	48,3	49,2
11 »	43,2	43,9	44,8	47,8	48,7	49,6
12 »	43,5	44,2	45,0	48,2	49,2	50,1
15 »	44,2	45,1	45,9	48,7	49,6	50,5
18 »	44,9	45,7	46,4	49,0	49,9	50,9
21 »	45,4	46,1	46,9	49,4	50,2	51,2
24 »	46,0	46,6	47,3	49,7	50,5	51,5
27 »	46,5	47,0	47,8	50,0	50,7	51,8
30 »	47,0	47,5	48,0	50,4	51,0	52,0
33 »	47,3	47,9	48,4	50,6	51,4	52,4
36 »	47,6	48,1	48,6	51,0	51,7	52,7
3 1/2 y.o.	47,8	48,3	49,0	51,5	52,3	53,2
4 »	48,0	48,6	49,3	51,9	52,7	53,5
4 1/2 y.o.	48,3	48,9	49,7	52,3	52,9	53,8
5 y.o.	48,5	49,1	50,0	52,5	53,2	54,0

5 1/2 »	48,8	49,4	50,2	52,7	53,5	54,2
6 »	49,0	49,6	50,3	52,8	53,7	54,5
6 1/2 »	49,2	49,8	50,6	53,0	53,9	54,6
7 »	49,4	50,0	50,7	53,3	54,1	54,8
8 »	49,7	50,3	51,0	53,6	54,4	55,2
9 »	50,0	50,6	51,3	53,9	54,6	55,4
10 »	50,3	50,8	51,5	54,1	54,8	55,6
11 »	50,4	51,0	51,7	54,3	55,0	55,8
12 »	50,5	51,2	51,9	54,6	55,2	56,1
13 »	50,6	51,4	52,0	54,8	55,5	56,4
14 »	50,7	51,5	52,1	55,0	55,7	56,4
15 »	50,8	51,6	52,2	55,2	55,9	56,7
16 »	50,9	51,7	52,3	55,3	56,0	56,9
17 »	51,0	51,8	52,4	55,4	56,1	57,1

Distribution of the chest circumference (cm) by age (boys).

	Centile					
Age	3	10	25	75	90	97
0 mon.	31,7	32,3	33,5	36,0	36,8	37,3
1»	33,3	34,1	35,4	38,0	38,9	39,4
2»	35,0	35,7	37,0	40,0	40,8	41,6
3»	36,5	37,3	38,4	42,1	43,1	43,8
4»	38,1	38,8	39,8	43,5	44,5	45,7
5»	39,3	40,1	41,1	45,0	46,2	47,7
6 »	40,6	41,4	42,4	46,3	47,6	49,0
7 »	41,7	42,5	43,4	47,5	48,9	50,1
8 »	42,7	43,5	44,4	48,5	49,9	51,1
9 »	43,6	44,3	45,2	49,3	50,7	52,0
10 »	44,3	45,0	46,0	50,0	51,5	52,8
11 »	44,8	45,6	46,6	50,8	52,2	53,6
12 »	45,3	46,1	47,0	51,2	52,8	54,3
15 »	46,0	46,8	47,9	51,9	53,7	55,0
18 »	46,5	47,4	48,6	52,4	54,3	55,6
21 »	47,0	47,9	49,1	52,9	54,7	56,0
24 »	47,6	48,4	49,5	53,2	55,1	56,4
27 »	47,8	48,7	49,9	53,5	55,6	56,8
30 »	48,2	49,1	50,3	53,9	55,8	57,3
33 »	48,4	49,3	50,5	54,2	56,1	57,7
36 »	48,6	49,7	50,8	54,6	56,4	58,2
3 1/2 y.o.	49,2	50,3	51,5	55,0	57,1	59,0
4 »	50,0	51,2	52,4	55,8	58,0	59,9
4 1/2 y.o.	50,8	52,0	53,3	56,9	59,0	61,2
5 y.o.	51,3	52,8	54,0	58,0	60,0	62,6
5 1/2 »	52,2	53,5	55,0	59,1	61,3	63,8
6 »	53,0	54,4	56,0	60,2	62,5	65,1
6 1/2 »	53,8	55,2	57,0	61,3	63,8	66,4
7 »	54,6	56,2	57,9	62,3	65,1	67,9
8 »	56,1	58,0	60,0	64,8	67,9	70,8
9 »	57,7	59,6	61,9	67,1	70,6	73,8
10 »	59,3	61,4	63,9	69,8	73,6	76,8

11 »	61,1	63,0	66,0	72,1	76,2	79,8
12 »	62,6	65,0	68,0	74,9	79,0	82,8
13 »	64,7	66,9	70,2	78,2	82,2	87,0
14 »	67,0	68,6	73,1	81,8	86,2	91,0
15 »	70,0	72,6	76,3	85,7	90,1	94,2
16 »	73,3	76,1	80,0	89,9	93,6	97,0
17 »	77,0	80,1	82,9	92,2	95,5	98,4

Distribution of the chest circumference (cm) by age (girls).

	Centile					
Age	3	10	25	75	90	97
0 mon.	30,8	31,8	33,2	35,7	36,4	37,0
1 »	32,9	34,0	35,3	37,4	38,1	39,0
2 »	34,6	35,7	37,2	39,1	40,0	40,9
3 »	36,2	37,3	38,7	40,5	41,2	42,8
4 »	38,1	39,1	40,4	42,1	43,2	44,3
5 »	39,4	40,5	41,7	43,5	44,6	45,8
6 »	40,6	41,6	42,9	44,9	46,1	47,2
7 »	41,8	42,8	44,0	46,0	47,2	48,5
8 »	42,8	43,7	44,9	46,9	48,3	49,8
9 »	43,6	44,5	45,6	47,8	49,3	51,0
10 »	44,3	45,2	46,2	48,1	50,1	52,0
11 »	45,0	45,8	46,8	49,3	50,8	52,7
12 »	45,5	46,3	47,3	49,9	51,4	53,3
15 »	46,4	47,2	48,1	50,8	53,3	53,9
18 »	47,1	47,8	48,7	51,3	52,9	54,5
21 »	47,5	48,2	49,1	51,9	53,5	55,0
24 »	47,8	48,6	49,5	52,5	54,0	55,6
27 »	47,9	48,8	49,8	53,0	54,5	56,2
30 »	48,0	48,9	49,9	53,3	55,0	56,8
33 »	48,1	49,0	50,1	53,7	55,5	57,2
36 »	48,2	49,1	50,3	54,0	56,0	57,6
3 $^1/_2$ y.o.	48,6	49,5	51,0	54,3	56,2	57,8
4 »	49,2	50,4	51,6	55,1	56,9	58,6
4 $^1/_2$ y.o.	49,6	51,0	52,3	55,9	57,8	59,7
5 y.o.	50,4	51,6	53,0	56,9	58,8	61,0
5 $^1/_2$ »	50,9	52,2	53,9	57,8	60,0	62,2
6 »	51,5	53,0	54,8	58,6	61,2	63,6
6$^1/_2$ »	52,3	53,8	55,5	59,8	62,4	64,8
7 »	53,2	54,6	56,3	61,0	63,7	66,6
8 »	54,7	56,3	58,2	64,5	67,6	70,6
9 »	56,3	58,0	60,0	68,1	71,4	75,1
10 »	58,0	60,1	62,0	71,3	75,5	78,8
11 »	59,8	62,2	64,4	74,5	78,6	82,3
12 »	61,9	64,5	67,2	77,6	81,9	86,0
13 »	64,3	66,8	70,0	80,9	85,0	88,0
14 »	67,0	69,6	73,0	83,5	87,6	91,0
15 »	70,0	72,9	76,2	85,5	89,3	92,6
16 »	73,0	75,9	78,8	67,1	90,6	93,9
17 »	75,4	78,0	80,7	88,0	91,1	94,6

3. Key elements of early childhood education

I. Training with a baby starting from 2 - 3 weeks to 3 months

Gently talk to the baby, sing to him, at first standing straight and then closer to his face. Bypass around the bed - this initially stimulates by focusing and then tracking, localization of sound. Calling smile and maintain a lively condition (in the 3rd month).

Before each feeding and sleep, and in the 3rd month in the middle of waking, put the child on his stomach, periodically support the feet of the child with your hand, causing the phenomenon of crawling (Bauer). As a result, the ability to lift and hold the head develops, the tone of the abdominal muscles strengthens (while the presence of fatigue, turn the child on his back).

Take the child in your arms, first in a horizontal position, and from 1.5 months vertically in order to raise the emotional tone and develop the ability to lift and hold his head upright.

Suspend a big toy at a distance of 70 cm from his chest and a smaller one at a distance of 50-60 cm. Slowly move the hanging toy from side to side, strum, ring the toy, stimulating visual and auditory focus, tracking, and so on. From the middle of the 3rd month periodically lower the toy over the breast of the child, so that he could pull himself at her, waving his arms (stimulating the extension of the arms in preparation for grasping toys).

Recommended toys: a simple form large, bright, but not multi-color (abundance of colors exhausts the child), sounding rattles and balls (the children do not touch them, but only observe).

II. Training with a child between 3 and 6 months

Talk with the child, causing the response sounds (cooing) and maintaining a state of happiness, smile and laugh.

Often and for a longer time put the child in a playpen, or on a table on his stomach, place toys in front of him in a short distance to stimulate crawling. Show bright toys from the side to encourage turning first from the back to the stomach, and then from the abdomen to the back (you can help your child, gently pulling him by the hand). At this age, in any case the child should not be put standing or sitting.

Hang the toy at the level his breast so the child could outstretch arms, put a toy in the palms of the child, prompting him to capture and first retain with two, and then one arm.

Recommended toys: bright celluloid rattles, convenient for gripping, rings with toys attached to them, bells, and others. Toys in the form of balls and eggs are inconvenient in this age period, as they roll away far from the light touch of the child, easy to slip out of his hands.

III. Training with a child from 6 to 12 months

At the beginning, to stimulate babbling, play making sounds with the child, when he babbles himself (6 months), cause imitation of spoken syllables (from 6 months), and the simple words: "mama," "Give," "kitty" and others (by the end of the year). Developing an understanding of speech, talk a lot with your child, call the surrounding people, objects, actions. Teach abiding some movements and actions according to the word of the adult, initially reinforcing the keywords and helping the child to perform a task (from 7 - 8 months - "pat-a-cake," "give a hand", "bye-bye", with 9 -10 months - "Give a toy" keeping in mind that the child has to find this toy among several others and submit it, etc.).

Encourage him to a crawl (from 51/2 - 6 months), standing up (from 71/2 months), walking with support (6 - 9 months), and later (from 11 - 12 months) without it, beckon the child tenderly calling his name and showing a bright toy, sometimes helping him a little.

In order to maintain good emotional tone, as well as for the development of the child play funny games like "catch up, catch up" and "pat-a-cake".

For new experiences of the child and the development of speech, show animals, clockwork toys, and starting from the 10^{th} month show him pictures. Do not hang the toys, but put on a crib, playpen, on the floor. Show simple actions with objects, prompting the child to imitate.

Recommended toys: diverse and more complex, multi-color, sounding toys, from different materials - dolls, birds, rabbits, fish, etc. For the development of actions with objects children should be given balls and toys for sliding, all kinds of easily-opened boxes, toy pots for closing and opening , hollow blocks with five walls, folding dolls, balls for inserting and putting (not more than 2 - 3 pieces), small pyramids (of 2 - 3 thick rings). Plastic and metal bowls, baskets, small buckets and so on are useful for the same purpose. The child will be able to put balls and small toys in them.

IV. Training with a child in the second year of life

In the second year of life in order to promote understanding of the speech it is necessary to follow these:

a) to increase the number of memorized words (name of food, utensils, furniture, clothing, animals, birds, plants, etc., names of body parts, clothing, etc., quality of items, the main action);

b) to consolidate the relationship between objects and meanings of those words. Develop an understanding of connections and relationships between objects ("bird pecks grain");

c) to teach doing the instructions and orders of adults: in the first half of the year consisting of 1-2 action, in the second half - of several units ("Go somewhere", "take something", "bring me").

To stimulate speech activity it is required:

a) to increase the number of words spoken in the first half to 30 simple words (give, uncle) and onomatopoeia ("aw-aw", "be-be"), in the second half - 300 more complex words, not only nouns and verbs, but also indicating the subject matter and the quality of the relationship between objects (adverbs, adjectives, and so on). Accustom to use in the speech 2 - 3 complex phrases and make it in grammatical change;

b) to improve the imitation of audible sound combinations and words to learn to respond to the speech of the adult not only with the movements and actions, but also the available words. To call playback words denoting familiar objects that are currently not available ("where's our ball?", "Tell me, where is our ball?")

For the development of the movements it is necessary:

a) to improve and make the target for walking (teaching to walk on a limited and an inclined plane - on the board, step over single obstacles, keep the balance), climbing (to teach to climb a ladder, climb over a log, creep under the benches), throwing (teach throwing the ball in the basket). In the second half of the year it is necessary to develop the ability to run. To teach the simplest elements of dance. The children of the second year of life should not be jumping from a height because of the peculiarities of the anatomical structure of the foot (flat feet);

b) to develop (in the second half) different imitative movements ("how a bear walks?", "how a rabbit runs?");

c) to train to perform various actions on the verbal suggestion of movement, and even the rhyme words at the end of the year, like songs, first teaching one child and then the group of children.

Various actions with objects:

a) to teach your child to carefully observe the actions of the adults and imitate them; b) teach doing with objects and plot toys various targeted actions (in the first half - open and close, remove and put on, in the second half - to pour liquid, pour the sand into a large bowl, etc.) Role game enhances in the second year of life (the child plays certain actions of a driver, seller, etc.); c) develop the ability to follow through on mastered action (for example, to collect all pyramid); g) use playing with objects for the development of speech (by calling objects, their qualities, actions with them).

Recommended toys: pyramids, dolls (more complex), sandbox, hoops, balls. Scene toys: dolls (dressed), doll furniture, aluminum cookware, toy animals. Primitive building material. Various cars, trucks, "little things" in the bag or box (1 year 6 months). Sand (1, 6 months), and water (at the end of the second year) for the game. Clockwork toys, live animals for showing and telling stories.

For children’s playing in the second year to equip the corner of the room, cover the floor with a clean carpet, because at this age the child likes playing on the floor on his own.

V. Training from the third year of the child

In order to further understand the speech it is necessary:

a) to show more and more complex objects, actions, pictures, accompanied with representation of them by verbal explanations. To develop the child's impressions;

b) teach to understand spoken language unaccompanied with visual images, listen to short stories, short poems.

In order to stimulate active speech it is necessary:

a) to teach to speak sentences, correct pronunciation of words and changing the endings of words, align words in sentences;

b) to continue developing the child's emotional expressiveness of voice, encouraging to join in singing and singing;

c) cause active statements of the child - teach words to transmit the impressions (telling about the picture, etc.), to answer questions.

It is necessary to develop the movements:

a) contribute to the further development of coordination of general movements (simultaneous, economical and agile movements of the arms and legs) when walking, running, climbing, throwing (to eliminate unnecessary movements);

b) teach the signal to suspend the movement to move from one movement to another, change the rate of movement;

c) to develop a sense of rhythm, to dance to the music; d) continue to develop the coordination of fine movements. The development of the game and action with objects:

a) subjects mastered by children with the help of adult are submitted for independent activities (make sure that the child uses the objects correctly, attach the acquired skills);

b) develop a scene game based on the imitation of adults and older children, encourage initiative and ingenuity of the child in the game;

c) when using objects to specify their number, color, size, etc. - force to call the properties of objects, pick them up on the instructions.

Recommended toys and manuals: the same as for the children of the second year of life, but more complex, such as a bicycle, building material of various sizes and shapes, a variety of toy furniture and utensils, garments, scarves, aprons, and other more complex images and the first book, the first bingo, live animals, birds, fish, alloscope to display and story-telling. Targeted trips and excursions to expand the horizons of the child are necessary.

General training tasks of the child are associated with the formation of his future self as a member of the team.

Particularly important things in the second and the third year of a child's life are:

1) to develop the ability to engage himself, without interference of the adults (the second year), play with each other (feeling sorry for "offended", help "the victim"), to maintain order in toys, to protect them;

2) to teach to the self-care and mutual aid; develop curiosity, courage, perseverance, desire to overcome obstacles and bring it started to end.

VI. Training skills when eating

Encourage the child to the activeness while eating (lack of attention to the activeness of a small child when eating and especially forcible feeding leads to a decrease in appetite and prolonged inability to eat independently).

From 41/2 - 5 months to teach a child to eat with a spoon, removing food with lips, but not sucking it, as the children of the first months of life do. To nurture this skill a spoon with food only trays to the mouth of the child, putting it in mouth, prompting the baby to the appropriate movements.

From 61/2 - 7 months during feeding to give the child's hand a piece of white bread, cookies, teach him eat oh his own.

From 7 - 8 months to teach a child to drink from a cup (wide), which is held by an adult first, and then a child himself (in 12 months the child drinks from a cup on his own).

From 8 - 9 months of children who can sit while feeding should put on a special chair with a high back, armrests and footrest.

During feeding the child in the first year of life it is necessary to make sure that his face and clothes are clean (to teach the accuracy and develop a negative attitude towards slovenliness during meals).

From 1 year 2 months during feeding give the child a dessert or a teaspoon in a hand, directing it into his mouth with his hand (first child holds the spoon in the fist).

From 1 year 4 - 5 months encourage the child to have his own solid food, and then a liquid, only helping him to adjust the motion. Teach to use a napkin himself (in 1 year 6 months a baby eats any food with a spoon, but more often throws it, he uses a tissue when he is reminded. By age 2 he eats carefully without drenching, uses a napkin without reminders).

During the 2 - 3rd year teach children through verbal instructions and example to the cultural behavior at the table - to hold a spoon in his right hand, and bread on the left, not to soak the bread in the soup, tea, do not go away from the table with mouth full, to say "thank you", etc.

VII. Training hygienic rules

Washing hands, face. Training a child a positive, calm attitude to the process of washing it is necessary to perform washing cautiously, without causing discomfort to the child. Encourage the child to be active at washing: 8 - 9 months - to reach out to the jet of water, on the 2nd year - to take low hanging towel, rub hands with soap.

In the third year under adult supervision to self-soap his hands, wash hands and face at a narrow stream of water without dripping, wipe them dry.

Grafting gradually elementary hygiene skills from 1year 2 - 4 months to pay attention to dirty hands, face, wet nose, cause a negative attitude toward dirt (word, tone), immediately wash the soiled hands of the child, wipe his nose, to ensure that the child is accustomed to be clean and then asking him to wash or wipe.

From 1 year 6 months - teach him to use a handkerchief, drawing attention of the child on a dirty nose and offer to wipe it (by 2 years when necessary he uses a handkerchief himself).

На третьем году приучать по собственной инициативе умываться утром и вечером, мыть руки перед едой и после высаживания или загрязнения, вытираться только своим полотенцем (в 3 года ребёнок хорошо и аккуратно моет лицо и руки, вытирает их, вытирает нос и др.).

In the third year to teach initiative to wash in the morning and evening, to wash their hands before eating and after planting or dirt on his own, wipe only his own towel (in 3 years the child is properly and carefully washes his face and hands, drying them, wiping nose, etc.).

VIII. Potty training

From 5 - 6 months hang the child on the potty after sleep (if the child woke up dry), before going to bed, and periodically while he is awake, but not earlier than 30 minutes after feeding, try to guess when the child needs to urinate (without causing a negative reaction at potty training).

In 8 - 9 months make the child sit on the potty at the same time of the day for a short time (3 min). Accustom him to ask the potty, which is accompanied with the words like "pee-pee", "ah-ah", causing the child's imitation of words (by 1 year old, the child is comfortable with the potty, by 1 year, 6 months old he asks during the day, and by 2 years old should be asking at night as well).

At night, the children under 1 year old should not be seated on the potty but changed wet clothes when needed. The child of 2 - 3rd year of life can be seated at night more than once, if he needs it, after finding out what time such a need arises.

If the child sleeps dry, he is not seated at night.

IX. Dressing and undressing

Encourage the child to the activity when dressing and undressing: from 11 - 12 months - to stretch the leg for putting on stockings, boots, raise their hands when removing dresses and others.

From 1 year - pull out the stockings, boots, jacket (in 1 year 2 - 3 months the child himself tries willingly to undress and dress).

From 1 year 6 months old – to take off and put on stockings, knickers, unlace his boots.

From 2 years old – take off and put on with the help of an adult part of the clothes in a certain sequence - dress, pants, shirt. When stripping the clothes neatly fold them on a chair.

From 2 years 6 months old – to unbutton and button, untie and tie shoelaces (by 2 years the child takes off some clothes items - socks, shoes, pants, and in 2 years 6 months he dresses and undresses himself, but without buttoning up and unbuttoning, unleashing laces).

By 3 years old the child gets dressed and undressed almost on his own and can button up, tie shoelaces.

4. Basic biochemical serum parameters in children.

Indicant	Childhood period				
	newborn	infant	Pre-preschool	Preschool	School
Protein, g / L	47- 65	41- 73	59- 79	62- 78	70- 80
protein fraction (Electrophoresis):					
Albumin, g / l	23- 46	20- 50	40- 50	40- 50	40- 50
globulins, g / l:					
α1	0,9- 3,2	1,2- 4,4	1,0- 4,0	1,0- 4,0	1,0- 4,0
α2	2,4- 7,2	2,5 - 11,0	5,0- 10,0	5,0 - 10,0	5,0- 10,0
β	2,4- 8,5	1,6 - 13,0	6,0- 12,0	6,0 - 12,0	6,0- 12,0
γ	6,0 - 16,0	4,1- 9,5	6,0- 16,0	6,0 - 16,0	6,0- 16,0
Total lipids, g / l	1,7- 4,5	2,4- 7,0	4,5- 7,0	4,5- 7,0	4,5- 7,0
Triglycerides, mmol / l	0,2 - 0,86	0,3- 90,93	-	0,3- 90,93	-
Phospholipids mmol / l	0,6- 51,04	1,1- 72,08	1,3- 2,2	1,4- 2,3	1,8- 3,3
NEFA, mmol / l	1,2- 2,2	0,8- 0,9	0,3- 0,6	0,3- 0,6	0,3- 0,6
Cholesterol, mmol / l	0,1- 40,42	1,6- 4,9	3,7- 6,5	3,7- 6,5	3,7- 6,5
Nitrogen residual, mmol / l	14,- 622,8	17- 28	19- 29	19- 29	19- 20
Urea, mmol / l	2,5- 4,5	3,3- 5,6	4,3- 7,3	4,3- 7,3	4,3- 7,3
Uric acid, mmol / l	0,1- 40,29	0,1- 40,21	-	0,1- 70,41	-
Bilirubin, umol / L	до 102,6	3,4 - 13,7	3,4- 13,6	3,4 - 13,6	3,4- 13,6
Potassium, mmol / L	4,7 - 6,66	4,1- 55,76	4,15- 5,76	3,7- 5,1	3,7- 5,1
Sodium, mmol / L	135- 155	133- 142	125- 143	137- 147	137- 147
Calcium, mmol / l	2,3- 2,5	2,5 - 2,87	2,5- 2,87	2,5 - 2,87	2,5- 2,87
Magnesium, mmol / L	-	0,6- 60,95	0,75- 0,99	0,7- 80,99	0,7 8- 0,99
Phosphorus, mg / dL	1,78	1,2- 92,26	0,65- 1,62	0,6- 51,62	0,6 5- 1,62

Chlorine mmol / l	96 - 107	96 - 107	96- 107	96 - 107	96- 107
Iron mmol / l	5,0 - 19,0	3,9 - 14,5	9,3- 33,6	-	9,3- 33,6
Lactic acid, mmol / l	2,0- 2,4	1,3- 1,8	1,0- 1,7	1,0- 1,7	1,0- 1,7
Pyruvic acid, mmol / l	0,1- 70,32	0,0- 60,11	0,05 – 0,09	0,0- 50,09	0,0 5- 0,09
Citric acid, mmol / l	26 - 67	67 - 156	62 - 130	62 - 130	62 - 130

5. The contents of the main ingredients in the products used for the nutrition of children in the first year of life.

№	Name	Proteins	Fats	Carbohydrates	Energy value	
					kJ	kcal
	A. Dairy products					
1.	Breast milk	1,5	3,9	7,5	293	70
2.	Cow's milk	2,8	3,2	4,7	243	59
3.	Cow's skim milk	3,0	0,05	4,7	130	31
4.	Fat kefir	2,8	3,2	4,1	247	59
5.	Low-fat kefir	3,0	0,05	3,8	126	30
6.	Sweet acidophilus	2,7	3,2	10,8	351	84
	Milk formula					
7.	«Malyutka»	2,0	3,5	7,0	276	66
8.	«Malysh» (with buckwheat flour)	2,1	3,5	6,9	276	66
9.	«Malysh» (with rice flour)	2,0	3,5	7,1	276	66
10.	«Malysh» (with oatmeal)	2,1	3,5	6,9	276	66
	Acidophilus mixture					
11.	«Malyutka»	2,0	3,5	6,7	276	66
12.	Acidophilus mixture «Malysh»	2,0	3,5	6,7	276	66
13.	«Detalact»	1,8	3,5	7,0	280	67
14.	«Balbobek»	1,8	3,5	7,5	301	72
15.	«Vitalct-DM»	2,0	3,6	8,2	301	72
16.	«Biolact»	3,0	3,2	8,5	322	77
17.	«Baldyrgan»	2,8	3,6	7,1	314	75
18.	B-mix (rice, buckwheat, oats)	1,4	1,7	7,4	205	49
19.	C-mix (rice, buckwheat, oats)	1,9	2,3	7,6	247	59
20.	Cream 10% fat	3,0	10,0	4,0	494	118
21.	Curd unleavened	17,5	0,5	2,8	364	87
22.	Butter unsalted	0,6	82,5	0,9	3130	748
23.	Lyubitelskoye butter	1,0	77,0	0,7	2929	700
24.	Krestyanskoye butter	1,3	72,5	0,9	2766	661
	B. Complementary meals					
1.	Vegetable puree	2,0	3,0	16,9	442	105,5

2.	Meat mash	14,0	2,0	-	356	85,0
3.	Yolk (1 pc.)	2,3	5,3	0,1	251	60,0
4.	Porridge 5%	1,9	1,8	10,5	280	67,0
5.	Porridge 10%	3,8	5,9	16,3	573	137,0
6.	Sunflower oil refined	-	99,9	-	3761	899,0
7.	Ground meat	16,0	3,1	-	393	94,0
8.	Sugar syrup (100%)	-	-	95,5	1498	358,0
9.	Fruit jelly	-	-	12,0	209	50,0
10.	Fruit Mousse	0,8	-	17,6	343	82,0
11.	Orange juice	0,6	-	13,7	247	59,0
12.	Lemon juice	0,9	-	8,7	163	39,0

Continuation

№	Name	Proteins	Fats	Carbohydrates	Energy value	
					kJ	kcal
	C. Canned milk products					
1.	Milk powder	25,6	25,0	39,4	1987	475
2.	Condensed milk	8,3	9,5	11,3	678	162
3.	Condensed milk with sugar	7,2	8,5	56,0	1318	315
4.	Cream, dried	23,0	42,7	26,3	2406	575
	Milk formula, dried					
5.	«Malyutka»	15,0	25,0	52,0	2008	480
6.	«Malysh» (with buckwheat flour)	16,0	25,0	51,0	2008	480
7.	«Malysh» (with rice flour)	15,0	25,0	52,0	2008	480
8.	«Malysh» (with oatmeal)	16,0	25,0	51,0	2008	480
9.	Acidophilus mixture «Malyutka» (dried)	15,0	25,0	50,7	2008	480
	Acidophilus mixture «Malysh» (dried)					
10.	C- mixture with buckwheat broth	15,0	25,0	50,7	2008	480
11.	C- mixture with rice broth	18,4	16,4	56,7	1815	434
12.	C-mixture with oat broth	17,4	16,3	57,8	1812	433
13.	A mixture of milk with buckwheat flour	18,9	16,3	55,8	1807	432
14.	A mixture of rice flour to milk	17,5	15,7	55,0	1749	418
15.	A mixture of milk with oatmeal	16,7	15,6	55,5	1745	417
16.	«Vitalact»	17,4	16,4	54,5	1766	422
17.	«Detalact»	15,0	24,0	53,5	1992	476
18.	Enpit protein	13,7	27,0	53,0	2138	511
19.	Enpit fat	44,0	14,0	30,7	1745	417
20.	Enpit low-fat	21,7	41,0	28,9	2360	564
21.	Enpit lactose-free	42,1	1,0	44,9	1448	346
22.		24,2	28,1	41,7	2117	506

Canned meat products (for children)

1.	«Kroshka»	14,2	5,6	1,3	469	112
2.	«Malysh»	13,0	9,0	2,6	598	143
3.	«Malyutka»	13,0	11,0	2,6	674	161
4.	«Winni-Pouh»	14,0	10,0	2,6	653	156
5.	«Malyshok»	12,0	6,0	2,6	469	112
6.	«Hercules»	11,5	12,0	2,6	686	164
7.	«Bezzubka»	12,0	11,0	2,6	657	157
8.	«Cheburashka»	12,0	9,0	2,6	582	139
9.	«Yazychok»	9,0	9,0	2,6	531	127

Canned vegetables

1.	Vegetable soup with barley	2,3	5,7	19,4	556	133
2.	Vegetable soup with green peas	1,7	5,8	15,2	485	116
3.	Mashed carrots with semolina	1,9	1,6	10,6	255	62

Continuation

№	Name	Proteins	Fats	Carbo-hydrates	Energy value	
					kJ	kcal
	Canned fruits					
1.	Apricots puree	1,2	0,1	17,9	318	76
2.	Apples puree	0,6	0,1	19,2	322	77
3.	Prunes puree	0,8	0,1	27,8	460	110
4.	Apples and cherries puree	0,5	0,1	22,8	377	90
5.	Carrot juice	1,1	-	5,6	109	26
	Cereals					
	Milk Porridge					
1.	«Malysh»	14,5	19,5	57,5	1879	449
2.	Buckwheat Milk Porridge	15,0	11,6	62,1	1661	397
3.	Rice Milk Porridge	14,0	11,4	63,5	1661	397
4.	Oat Milk Porridge	14,2	13,5	60,8	1699	406
5.	Semolina Milk Porridge	15,4	11,6	61,9	1665	398

Note. The calculations are given in 100 ml (g) according to the book: Chemical composition of foods / Ed. by A.A. Pokrovsky.

Eczematous dermal lesions

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